United States
Department of
Agriculture

Soil
Conservation
Service

Cape May
Court House, NJ

1992 ANNUAL REPORT

Cape May Plant Materials Center

BAYBERRY
(Myrica pennsylvanica Loisel.)

BEACH PLUM
(Prunus maritima marsh.)

RUGOSA ROSE
(Rosa rugosa, Thunb.)

TABLE OF CONTENTS

Trade names used herein are for convenience only. No endorsement of products is intended, nor is criticism of unnamed products implied.

PERSONNEL

Manager	Donald W. Hamer
Asstistant Manager	Michael R. Fournier
Agronomist	Dr. Sandra J. Primard
Senior Technician	Noel J. Murray
Secretary	Barbara A. Turnier
Tractor Operator	James T. Futrell
Technician	Scott R. Waddell
Biological Aid (Intermittent)	Daniel B. Young (from 6/1/92)

PLANT MATERIALS SPECIALISTS

W. Curtis Sharp	National Plant Materials Specialist
David G. Lorenz	NENTC Plant Materials Specialist
Christopher F. Miller	NJ Plant Materials Specialist
Keith Salvo	NC Plant Materials Specialist

CAPE MAY PMC STATE CONSERVATIONISTS' ADVISORY COMMITTEE

Cecil B. Currin, Chairperson	NJ State Conservationist
Richard A. Gallo	MA State Conservationist
Coy A. Garrett	NC State Conservationist
George Norris	VA State Conservationst

INTRODUCTION

History & Origin

The activities of the Cape May Plant Materials Center (CM PMC), for the calendar year of 1992 are contained in this report. The PMC is solely operated by the United States Department of Agriculture's Soil Conservation Service (USDA-SCS) in the state of New Jersey. The 88 acre Cape May PMC was established in 1965 after extensive storm damage had eroded much of the Mid-Atlantic coastline. The service area of this PMC is served by two Plant Materials Specialists stationed in North Carolina and New Jersey.

The Cape May PMC has been given the task of developing and promoting new and improved plants, as well as improving cultural methods and management techniques for conserving our vital natural resources. The primary objectives of the Cape May PMC in producing improved plants for conservation use include:

- Improve water quality.
- Reduce excessive cropland erosion.
- Reduce coastal shoreline and tidal bank erosion.
- Conserve natural resources in urban and rural areas.
- Improve organic waste management techniques
- Improve grassland management techniques and forage quality
- Improve habitat for fish and wildlife

Although, the Cape May PMC has traditionally concentrated on reducing coastal sand dune and tidal bank erosion, the use of plant materials to improve water quality and establish wetlands has become the priority for its service area. The Cape May PMC will meet these newly prioritized objectives as we enter into the new decade of the 90's. The procedure by which the center develops and promotes plant materials to meet such objectives is as follows:

-- Collect and evaluate plant materials including native collections, foreign plant introductions and strains from plant breeders.

-- Increase seed and/or plants of potential new releases.

-- Make advanced evaluations of selected accessions under simulated field conditions in comparison with a standard variety.

-- Determine cultural requirements of needed plant materials.

-- Make off-center plantings on problem sites to obtain information on plants for eventual use on these sites.

-- Provide plant propagules for field plantings to Soil and Water Conservation Districts where the final evaluation of a new plant is to be made.

-- Develop, name and release new varieties in cooperation with the New Jersey Agricultural Experiment Station or other cooperating agencies.

-- Maintain and produce breeder or foundation seed or stock of released varieties at the center in accordance with the New Jersey plant and seed certification standards.

Location & Site Description

The Cape May Plant Materials Center is located in Cape May County which is New Jersey's southern most county. The center is approximately 24 miles south of Atlantic City, New Jersey sandwiched between the Garden State Parkway and US Route 9. Approximately, 500 feet east of the PMC starts the tidal marsh which surrounds Great Sound, a body of water lying between the PMC and the Borough of Avalon.

The climate at the Cape May PMC varies from semi-humid to semi-maritime conditions with average precipitation at 41 inches. During periods when precipitation is below normal, a deep 5.5 acre pond, on the PMC, is utilized for irrigation. The average annual maximum and minimum temperatures at the PMC are 63ˆF and 44ˆF, respectively. The Cape May PMC lies in USDA Plant Hardiness Zones 7b, with approximately a 190 day growing season.

The soils on the Cape May PMC are the product of wind mixed marine soils and glacial outwash which has weathered since the Pleistocene Age. The Downer, Sassafras, Fort Mott, and Woodstown soil series are all found on this property with the Downer and Sassafras predominating the acreage. The soils on the Cape May PMC can be generally described as nearly level, well drained, with low to moderate naturally fertile soils which are found at higher land locations. These soils encountered at the Cape May PMC are usually strongly acid in their natural state. The surface feature of these soils ranges from sand to loamy sand. Most fruits and vegetables can be grown on these soils but irrigation is a necessity to insure success. The elevations of the PMC range from 12 to 22 feet above sea level, with slope not exceeding one percent. The four soil series listed above have Soil Capability Classes ranging from I for the Sassafras series

to III for the Fort Mott series. When trees are considered for production, the site indices for native oak, hickories, gums and pines range from 66 to 85.

Agricultural operations are predominantly cash row crops, orchards, truck crops, specialty crops, and poultry. Livestock enterprises have disappeared from many farms which have switched to continuous cultivated crops. This trend to cash crop operations has reduced the use of hay and pasture plants in the cropping systems. Clean cultivation on large tracts of land has increased soil erosion. The problem is especially prevalent on large open areas of flat sandy soils and all sloping land during periods of inadequate soil cover.

Nonagricultural activities play a dramatic role in the use of conservation plants. There is a large portion of this area covered by hardwood and pine forests, much of which is not managed. Extensive areas of tidal marsh are vital to the seafood and wildlife resources which are essential to this area's economy. Also, sand and gravel mining, expanding land transportation systems, increasing number of recreational facilities, and construction of industrial as well as residential developments, are all areas where plants can be used to stabilize disturbed sites.

Fifteen percent of the nation's population lives within commuting distance of the area served by the center. In most areas, an extensive summer resort industry has expanded into a year-round enterprise, creating a demand for high use recreational facilities.

A map illustrating the distribution of the Cape May PMC's Off-Center project sites follows which indicates the PMC's current workload (See Off-Center Project Location Map). The area served by the Cape May PMC includes the mid-Atlantic plain and the piedmont area, extending from Cape Cod, Massachusetts to Sunset Beach, North Carolina (See Service Area Map). The Major Land Resource Areas within the service area are listed below under the nine states each is associated with.

Massachusetts

- 143 - Northeastern Mountains
- 144A - New England and Eastern New York Upland, Southern Part
- 144B - New England and Eastern New York Upland, Northern Part
- 145 - Connecticut Valley
- 149B - Long Island, Cape Cod Coastal Lowland

Connecticut

- 144A - New England and Eastern New York Upland, Southern Part
- 145 - Connecticut Valley

Rhode Island

- 144A - New England and Eastern New York Upland, Southern Part

New York
149B - Long Island - Cape Cod Coastal Lowland

New Jersey
144A - New England and Eastern New York Upland, Southern Part
148 - Northern Piedmont
149A - Northern Coastal Plain

Maryland
148 - Northern Piedmont
149A - Northern Coastal Plain
153B - Tidewater Area
153C - Mid-Atlantic Coastal Plain

Delaware
148 - Northern Piedmont
149A - Northern Coastal Plain
153C - Mid-Atlantic Coastal Plain

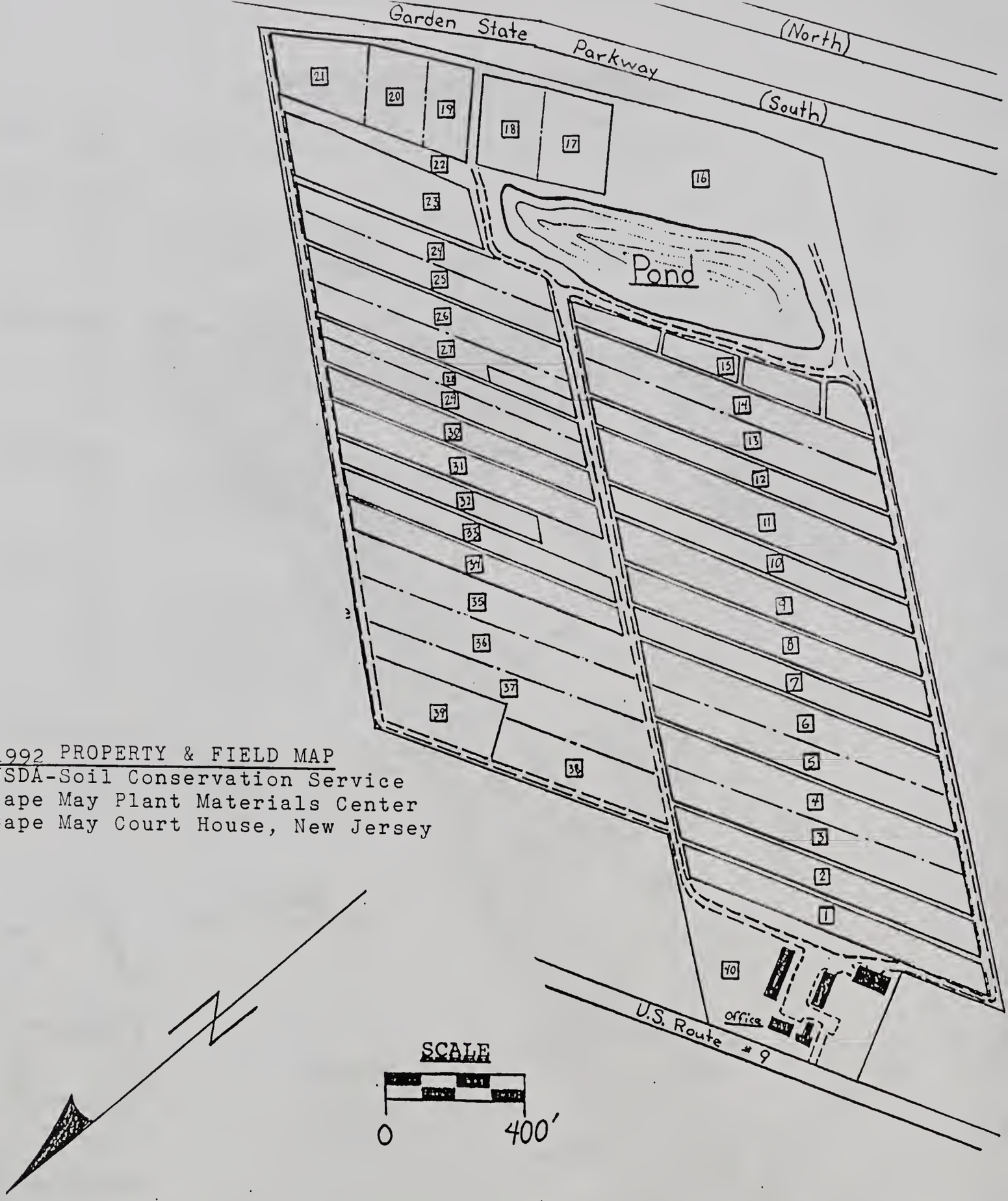
Virginia
133A - Southern Coastal Plain
136 - Southern Piedmont
153A - Atlantic Coast Flatwoods
153B - Tidewater Area
153C - Mid-Atlantic Coastal Plain

North Carolina
133A - Southern Coastal Plain
136 - Southern Piedmont
153A - Atlantic Coastal Flatwoods
153B - Tidewater Area

CAPE MAY - PMC LOCATION MAP

USDA - Soil Conservation Service

Cape May Court House, NJ



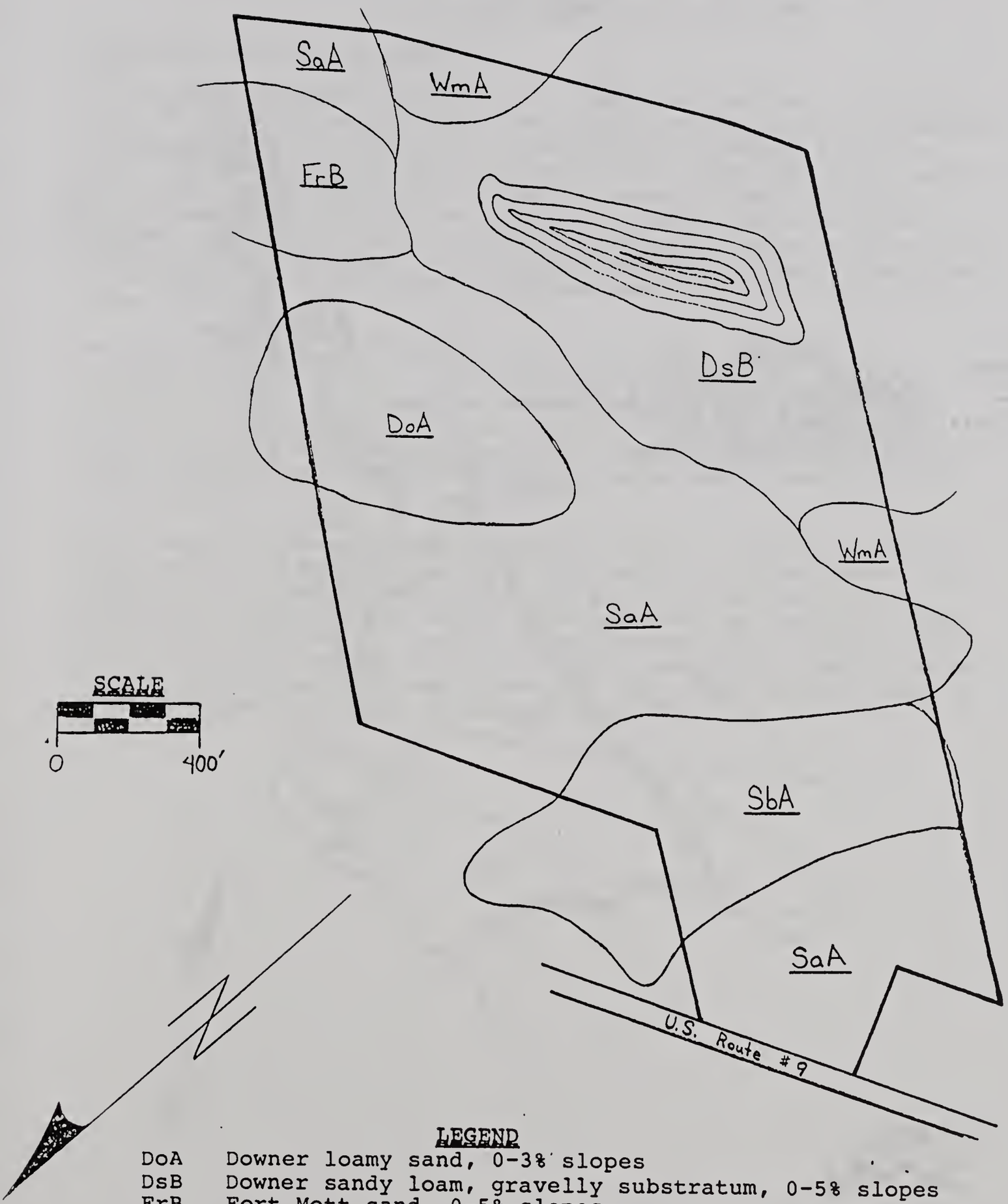
1992 PROPERTY & FIELD MAP
USDA-Soil Conservation Service
Cape May Plant Materials Center
Cape May Court House, New Jersey

LEGEND

- Field Number
- Access Lane
- PMC Buildings
- Field Divisions (No Field Border)
- Pond

CAPE MAY - PMC SOILS DELINEATIONS

USDA - Soil Conservation Service
Cape May Court House, NJ

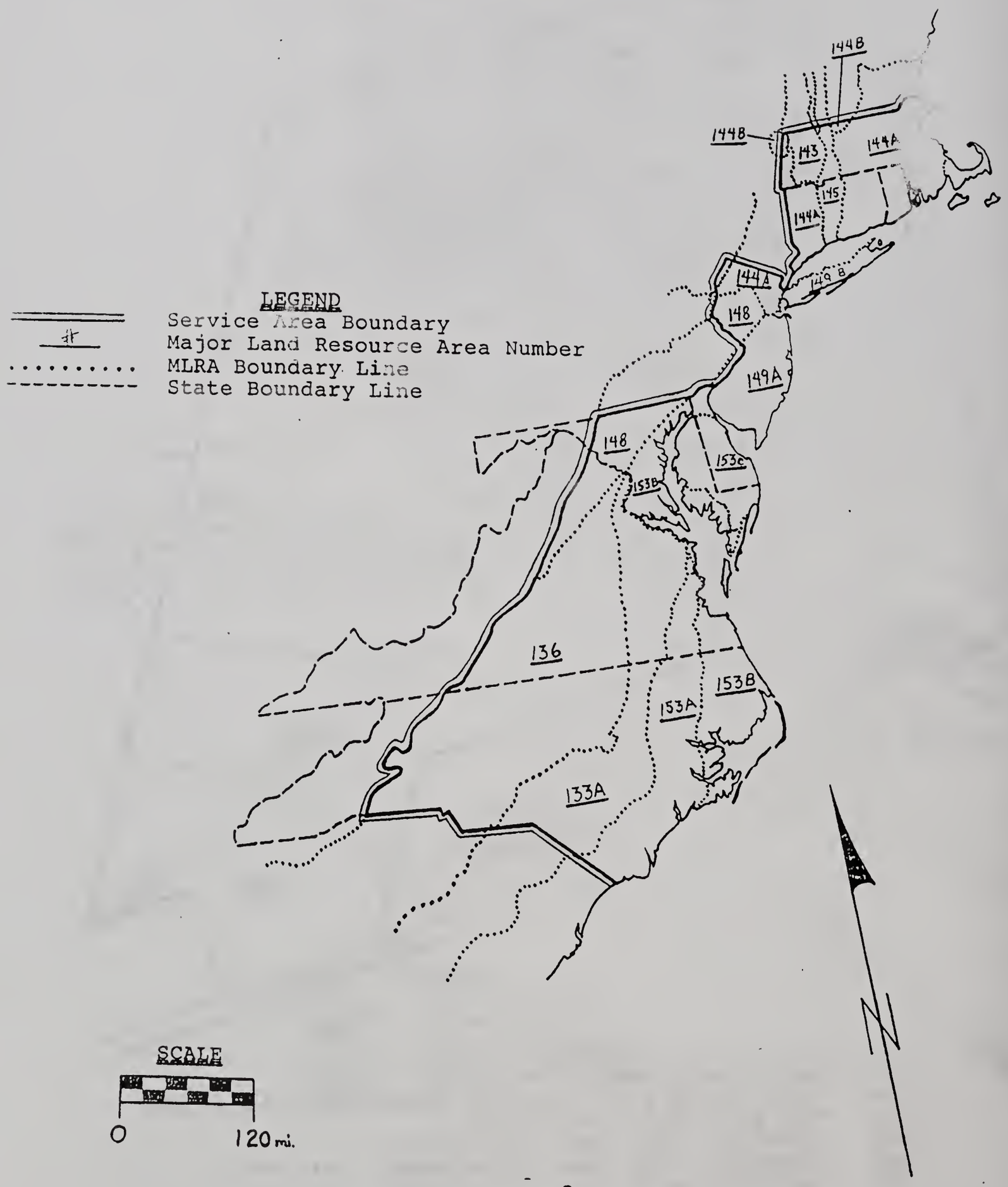


LEGEND

DoA	Downer loamy sand, 0-3% slopes
DsB	Downer sandy loam, gravelly substratum, 0-5% slopes
FrB	Fort Mott sand, 0-5% slopes
SaA	Sassafras sandy loam, 0-2% slopes
SbA	Sassafras sandy loam, water table, 0-2% slopes
WmA	Woodstown sandy loam, 0-2% slopes
	Pond

SERVICE AREA MAP

USDA - Soil Conservation Service
Cape May Plant Materials Center
Cape May Court House, NJ



SERVICE AREA

Description of Service Area

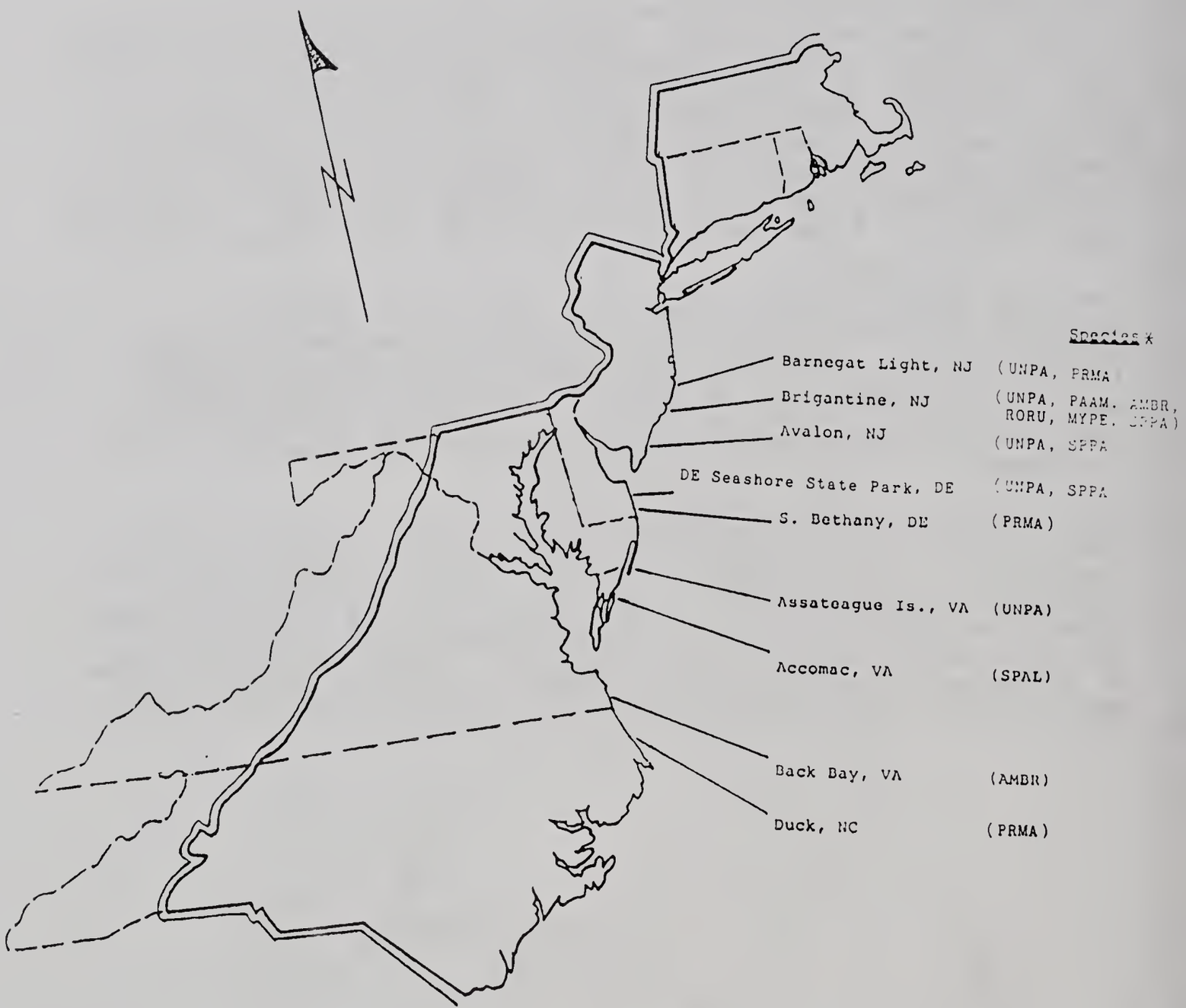
The soils, topography, climate, and land use combine to produce a distinct plant resource area. The soil-forming materials include glacial outwash and underlying beds of sand, gravel, silt, and clay. Problems in this area include active sand dunes that exist along the coast, wind erosion which occurs on sandy cultivated fields, and water erosion on sloping cropland, and stream bank erosion which threatens the tidal estuaries. The soils vary from excessively well drained to poorly drained and swampy. There are large tracts of tidal marsh bordering bays, river inlets and the ocean.

The topographic relief ranges from large areas of level or slightly sloping land to less extensive sections of moderately rolling ridges. The relatively level coastal plain rises from sea level to elevations of more than 600 feet in the piedmont. Level to gently undulating topography characterizes the coastal plain, while gentle slopes and steep ridges are predominant in the piedmont.

The climate is tempered by the Atlantic Ocean. There are wide fluctuations in annual precipitation, and to a lesser extent, in temperature. Drought years do occur and tropical hurricane storms are common. Mean annual precipitation in the area ranges from 38 to 46 inches. The frost-free season varies from 170 to 250 days, with the mean being 192 days. Length of growing season is affected by latitude and elevation. The Cape May PMC Service Area includes USDA Plant Hardiness Zones 5-8.

OFF-CENTER PROJECT LOCATION

USDA - Soil Conservation Service
Cape May Plant Materials Center
Cape May Court House, NJ



SCALE

0 120 mi.

LEGEND

Service Area Boundary

State Boundary

* AMBR -- Ammophila breviligulata
* MYPE -- Myrica pensylvanica
* PAAM -- Panicum amarum
* PRMA -- Prunus maritima
* RORU -- Rosa rugosa
* SPAL -- Spartina alterniflora
* SPPA -- Spartina patens
* UNPA -- Uniola paniculata

WEATHER RECORDS AT CAPE MAY PLANT MATERIALS CENTER FOR 1992

	Air Temperature °F					4" Soil Temperature °F					Precipitation			
	Maximum			Minimum		Maximum			Minimum		Total	Devi-	Greatest	No.
Month	Ext.	Av.	Deviation	Av.	Ext.	Ext.	Av.	Deviation	Av.	Ext.	Inches	ation	Daily	Days
Jan.	66	43	+2	+4	27	7	49	39	0	-3	34	30	1.07	-2.34	.51	5
Feb.	61	44	+1	+2	27	12	47	38	-1	-3	34	31	2.91	-0.11	.95	9
March	63	48	-2	+1	34	19	53	42	-4	-2	40	34	2.38	-1.18	.62	9
April	81	59	-1	-2	39	27	67	56	0	-4	46	37	1.32	-2.24	.49	9
May	89	66	-3	-3	47	31	73	62	-4	-7	53	48	2.48	-1.19	1.04	8
June	88	74	-4	-3	57	45	77	72	-4	-6	64	57	3.10	-0.05	1.81	8
July	98	82	-2	-1	65	52	85	78	-3	-4	72	67	2.61	-0.13	.82	13
Aug.	92	79	-4	-3	61	50	84	75	-5	-6	70	64	6.99	+2.86	2.55	11
Sept.	84	77	0	0	58	38	77	71	-3	-4	66	58	4.35	+1.59	2.70	10
Oct.	81	64	-2	-5	40	28	66	59	-5	-9	51	35	1.42	-1.81	.40	6
Nov.	73	55	+1	-2	37	24	58	51	+1	+1	48	39	3.38	-0.06	1.49	10
Dec.	55	46	0	+2	31	13	47	42	-2	-3	38	25	3.71	+0.07	1.50	11
1992	98	61			44	7	85	57			51	25	35.67	-4.59	2.70	109
Normal*		63			44			60			56		40			

*Normal based on:

27 yr. Air Temperature Average; 23 yr. Soil Temperature Average; 27 yr. Precipitation Ave.

Frost Free Days 193 - April 10 to October 20, 1992. Normal 192 days.

There was no measurable snow in 1992.

WATER QUALITY PROJECTS

1. PLANT CHEMICAL RECLAMATION PROJECT

2. INITIAL EVALUATION OF SWEET VERNALGRASS (*ANTHOXANTHUM ODORATUM*)

3. PROPAGATION TECHNIQUES FOR PERENNIAL WETLAND PLANT SPECIES OF THE MID-ATLANTIC OF THE UNITED STATES

1992 Progress Report of the Plant Chemical Reclamation Project for Cape May Plant Materials Center

Vegetative filter strips have been used in the past to uptake excess nutrients, such as nitrates, before they reach the ground or surface waters. The objective of this project is to develop a plant materials list identifying the best possible plants for vegetative filter strip use under varying site conditions and management practices.

The following is a summary of the activities that took place during the calendar year of 1992 for the Plant Chemical Reclamation Project.

Water Collections

Fourteen water collections occurred during 1992. There were three collections in January, one in February, three in March, one in May, two in June, one each in August, September, October and November. The precipitation during the rainfall events ranged from 0.13-5.83 inches. The water samples were shipped to the University of Rhode Island during the fiscal year of 1992 for analysis of nitrate-nitrogen concentration.

Cutting Treatments and Tissue Collections

Three HARVEST treatment cutting dates of 1992 were: May 20 and 21; August 4 and 5; and September 24 and 25. Following the cuts, the clippings were removed from these plots.

All the cool-season grasses received a cut on May 20 and 21 while the warm-season grasses did not. For the August 4 and 5 cut, the two warm-season grasses were cut along with all the cool-season grasses. On the third cutting date of the year, the two warm-season grasses were cut along with all the cool-season grasses with the exception of 'Repell' perennial ryegrass (Lolium perenne) and sweet vernalgrass (Anthoxanthum odoratum).

In addition, on the second cutting date of the year, the plots of CLIPPED treatment were cut and the clippings were left on the plots.

On each of the three cutting dates of the year, all plots of the HARVEST treatment were sampled by clipping a one meter square area, collecting the clippings, obtaining a wet and dry weight and grinding the dried sample. The CLIPPED treatment plots were sampled on the first two cutting dates, only. The plant samples were shipped to the University of Rhode Island for analysis of total kjeldahl nitrogen.

Soil Collection

For soil fertility analysis soil samples were collected on January 29 and April 2 from all the plots and dried. The soil samples were shipped to the University of Rhode Island for analysis of nitrate-nitrogen.

Fertilization and Pest Control

The project received a total of 9 lbs. nitrogen per 1000 sq. ft. in the form of urea during 1992. The first fertilizer application was April 8 at a rate of 2 lbs. nitrogen per 1000 sq. ft. The second was at a rate of 2 lbs. nitrogen per 1000 sq. ft. on May 29. The third and fourth applications were at a rate of 1 lb. nitrogen per 1000 sq. ft. on August 6 and September 29, respectively. The last application took place on November 6 at a rate of 3 lbs. nitrogen per 1000 sq. ft.

A preemergence herbicide, Team, was applied on the cool-season grasses and CONTROL plots at a rate of 2 lbs. active ingredient per acre on April 7. To control broadleaf weeds in the cool-season grasses and CONTROL plots, 2,4-D Amine and Banvel were applied at a rate of 1/2 pt./A of each on April 28. To control weeds in the warm-season grasses, Atrazine 4L was applied at a rate of 4 pts./A on April 24.

Monthly Precipitation (inches)

Jan.	1.07	May	2.48	Sept.	4.35
Feb.	2.91	June	3.10	Oct.	1.42
March	2.33	July	2.61	Nov.	3.38
April	1.32	Aug.	6.99	Dec.	3.71

Laboratory Analyses Results:

Water Sample Analysis Results

The baseline water samples taken in July 1990 (Fig. 1) showed nitrate-nitrogen level averaging 27 ppm. This is higher than the drinking water standard of 10 ppm. It is felt that this high level is due to the previous cropping system of several years of 'Lathco' flatpea. In addition, soil disturbance causes some mineralization of soil nitrogen. The average nitrate-nitrogen levels decreased rapidly from that high level to 2 ppm by the spring of 1991. The fertilizer treatments (indicated by arrows on Fig. 1) of 1991 and 1992 contributed to the average nitrate-nitrogen levels rise and fall. Another high level of 27 ppm was reached by August 1992.

The average nitrate-nitrogen levels for 1991-92 for the individual grasses (Fig. 2) show the CONTROL plot to have the highest concentrations of approximately 30 ppm. The sweet vernalgrass and both switchgrass cultivars (Panicum virgatum) had the next highest nitrate-nitrogen levels of approximately 10-15 ppm. The two orchardgrasses (Dactylis glomerata), Kentucky bluegrass and perennial ryegrass had average nitrate-nitrogen levels of 5-7 ppm. The three grasses showing the lowest levels of 2-3 ppm were matua grass (Bromus wildenowii), reed canarygrass (Phalaris arundinacea) and tall fescue (Festuca arundinacea).

In comparing the average nitrate-nitrogen levels for all the CLIPPED plots versus the HARVEST plots, we see the HARVEST plots had a lower level of nitrate-nitrogen in the leachate. This may be due to the constant removal of the nitrogen rich forage from the plots. Also, grasses will uptake greater amounts of nitrogen when they are kept in an actively growing state.

Tissue Sample Analysis Results:

Yearly total of nitrogen-uptake by leaf tissue (Fig. 3) for 1991 shows the CLIPPED plots took up much less nitrogen than the HARVEST plots, with the exception of perennial ryegrass. This grass had the highest nitrogen uptake for the CLIPPED plots, 25 kg/ha. Matua grass and both switchgrasses had the lowest nitrogen-uptake by leaf tissue, 8-10 kg/ha. The remaining grasses had similar levels of nitrogen-uptake at 12-18 ppm.

For the HARVEST plots, reed canarygrass had by far the greatest nitrogen-uptake of 65 kg/ha. The lowest accumulation of nitrogen in the tissue was approximately 20 kg/ha for the two switchgrasses. Rising from this low level by increments of 5 kg/ha is perennial ryegrass at 25 kg/ha, sweet vernalgrass at 30 kg/ha, tall fescue and the two orchardgrasses at 35 kg/ha, matua grass at 40 kg/ha and Kentucky bluegrass at 45 kg/ha.

Data for 1992 is unavailable at this time.

Soil Sample Results

The nitrate concentration in the soil for 1991 was generally very low with levels less than 5 ppm (Fig. 4). This is probably due to the soil type being quite sandy. For the 0-12 inch depth (Fig. 4 & 5), we see the nitrate levels of spring versus the fall have no constant trend (i.e., one is not always higher than the other). There is slightly more nitrate in the soil of the HARVEST plots as compared to the CLIPPED plots. The soil nitrate levels for the CLIPPED plots are consistent for most grasses at the 2 ppm level with two exceptions, spring 1991 matua grass (16 ppm) and fall 1991 CONTROL (7 ppm).

For the 12-24 inch depth (Fig. 6 & 7), we see in most grasses the fall 1991 has a higher soil nitrate level than he spring 1991. The grasses of the HARVEST and the CLIPPED plots generally have levels of 3 ppm or less except for the fall 1991 CONTROL plots with levels at 6-7 ppm.

Data for 1992 is unavailable at this time.

Other Findings to Date

The two warm-season switchgrasses were slow to establish, but once established the growth was excellent. The population present is lower than the cool-season grasses. Grasshoppers enjoy this grass. Small amounts of leaf spotting is seen. The switchgrasses are the last to initiate spring growth and the first to go dormant in the fall of all the grasses.

Kentucky bluegrass does not put on much growth during the year. It goes dormant and turns brown in the heat of the summer. It is invaded by other grasses but also creeps into adjacent plots. It is sensitive to some herbicides.

Perennial ryegrass also does not put on much growth. It grows in clumps and volunteer grasses move in between the clumps. It goes dormant during the summer. Leaf hoppers are found in this grass and patch diseases are occasionally seen.

Tall fescue is one of the densest of the grasses in the study. It does not grow very tall, 12 inches. The leaves stand up; it has a dark green color that it holds in the winter and the summer. It is aggressive, though, and volunteers in most plots.

Sweet vernalgrass tends to die out and the stands are becoming thin. It has a leaf spot disease. It grows in clumps and is invaded by other grasses and weeds. It does not produce much growth during the year. This grass is the first of the cool-season grasses to greenup and quickly produces seedheads.

Matua grass appears green all year long. It does get downy mildew during humid weather but persists. This grass will produce seedheads continuously. The leaves are decumbent.

Reed canarygrass is the slowest cool-season grass to greenup and quickest to go dormant in the fall. It does produce one of the thickest stands with upright leaves and the grasshoppers like it. It sends rhizomes out into adjacent plots and is hard to get rid of volunteer plants. The lower stems and leaves are papery brown and upon clipping, it looks dead. It is slow to respond after clipping.

The two orchardgrasses are practically identical and almost impossible to tell apart. These produce thick stands with decumbent leaves. There is some leaf spotting. This grass also volunteers into adjacent plots.

Several grass species grow taller and greener in the CLIPPED plots versus the HARVEST plots.

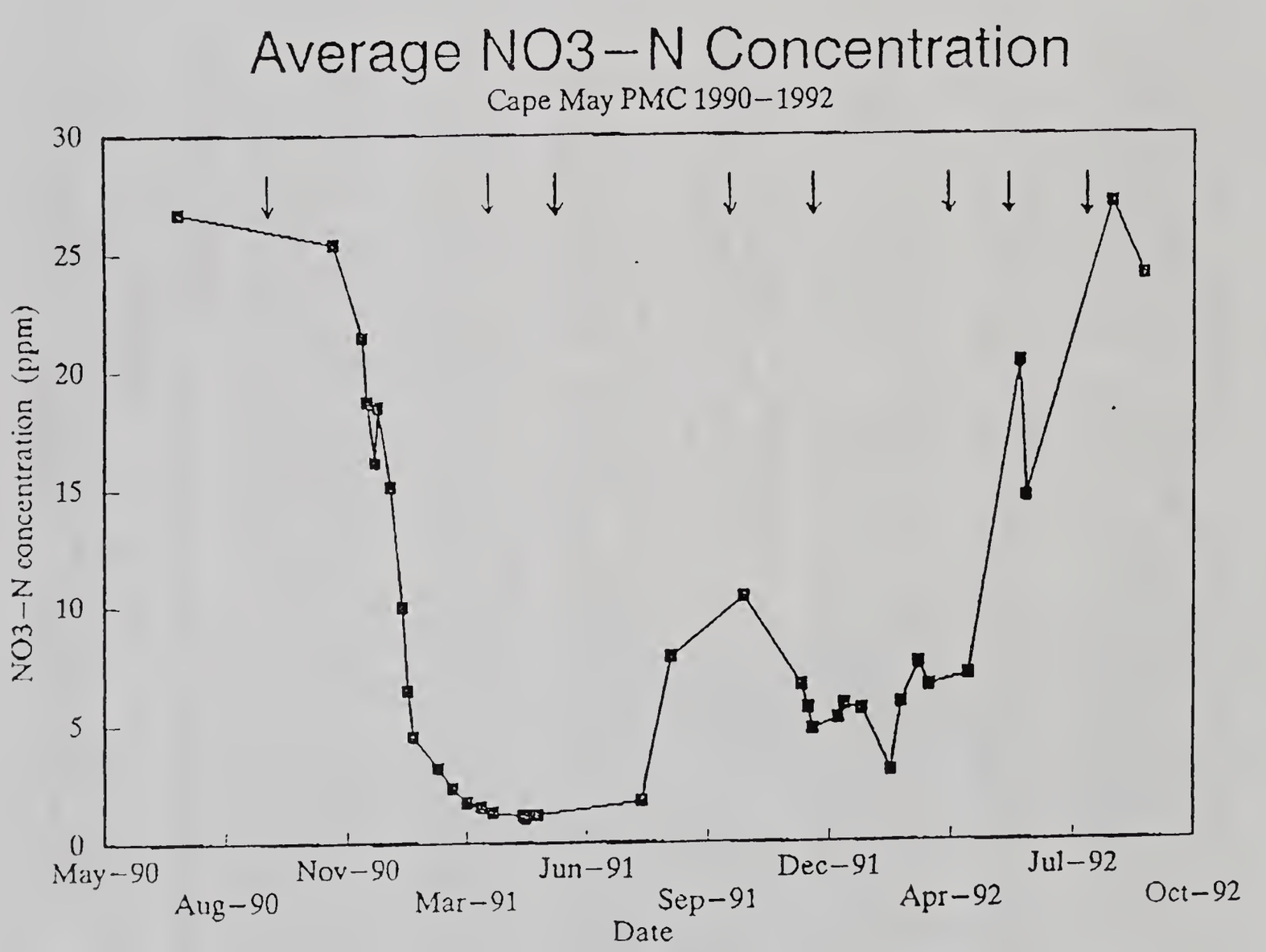

Average NO3−N Concentration
Cape May PMC 1990−1992
NO3−N concentration (ppm)
30
25
20
15
10
5
0
May−90
Aug−90
Nov−90
Mar−91
Jun−91
Sep−91
Dec−91
Apr−92
Jul−92
Oct−92
Date

Fig. 1

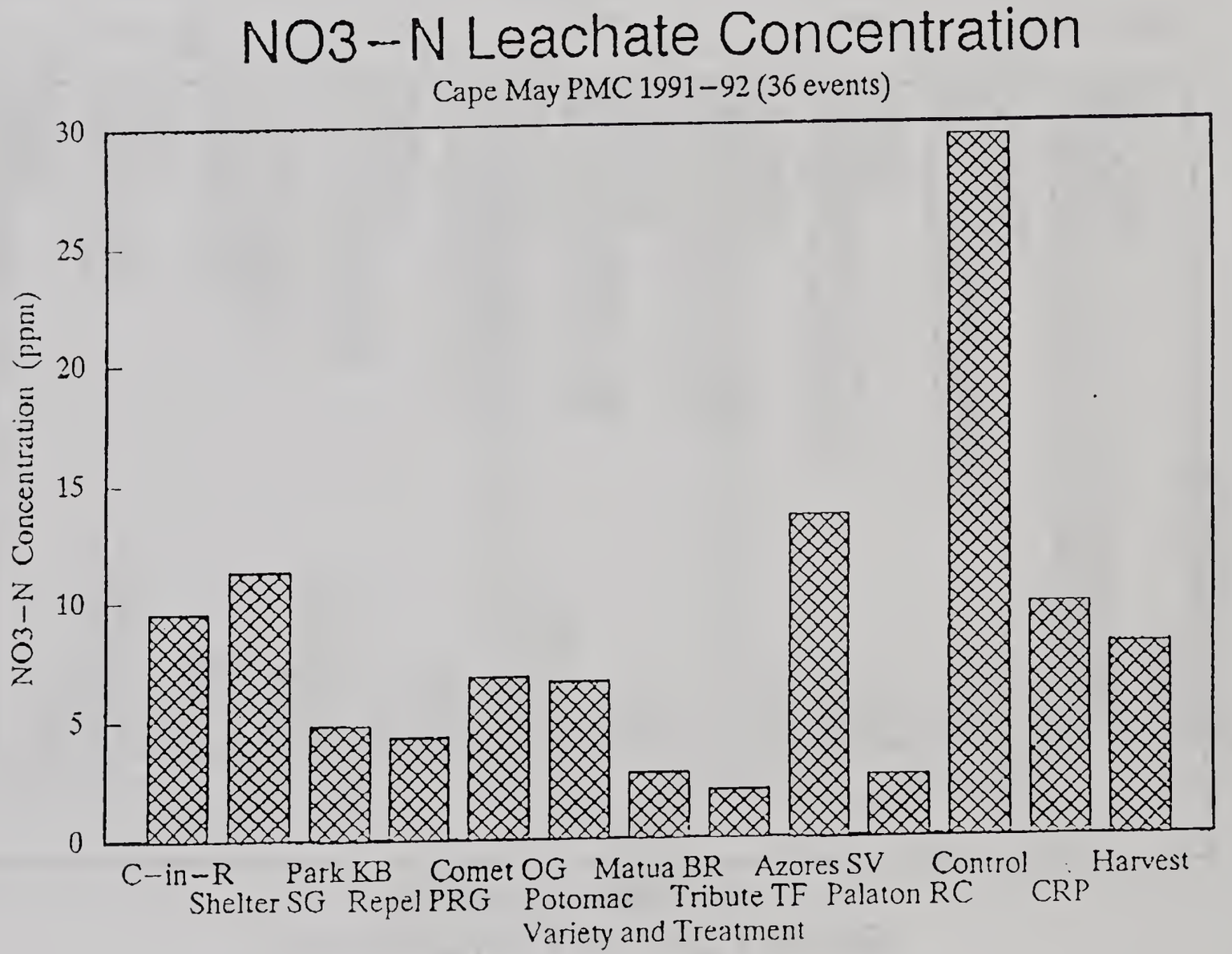

NO3–N Leachate Concentration
Cape May PMC 1991–92 (36 events)
NO3–N Concentration (ppm)
0
5
10
15
20
25
30
C–in–R
Shelter SG
Park KB
Repel PRG
Comet OG
Potomac
Matua BR
Tribute TF
Azores SV
Palaton RC
Control
CRP
Harvest
Variety and Treatment

Fig. 2

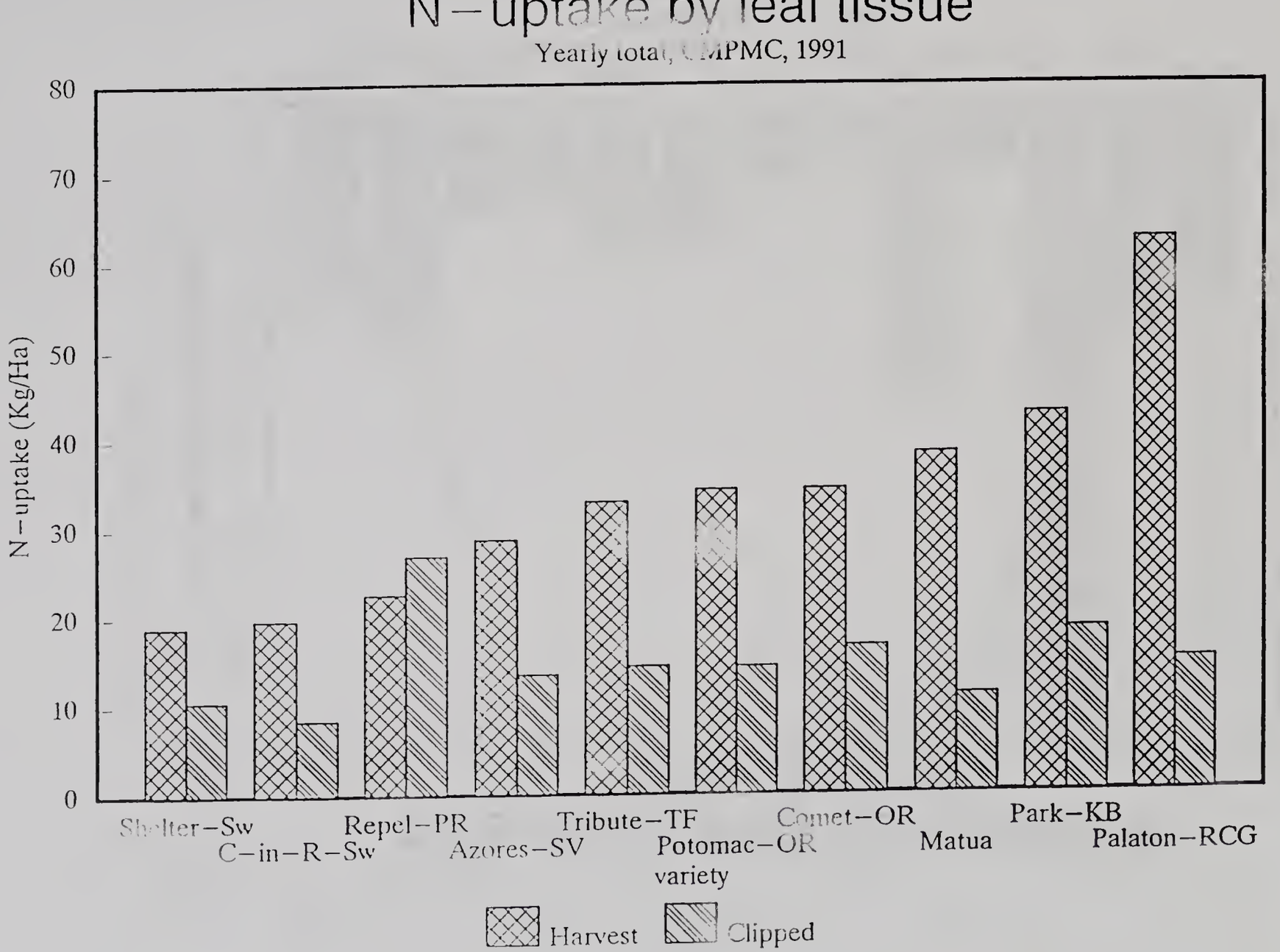

N–uptake by leaf tissue
Yearly total, CIMPMC, 1991
N–uptake (Kg/Ha)
80
70
60
50
40
30
20
10
0
Shelter–Sw
C–in–R–Sw
Repel–PR
Azores–SV
Tribute–TF
Potomac–OR
variety
Comet–OR
Matua
Park–KB
Palaton–RCG
Harvest
Clipped

Fig. 3

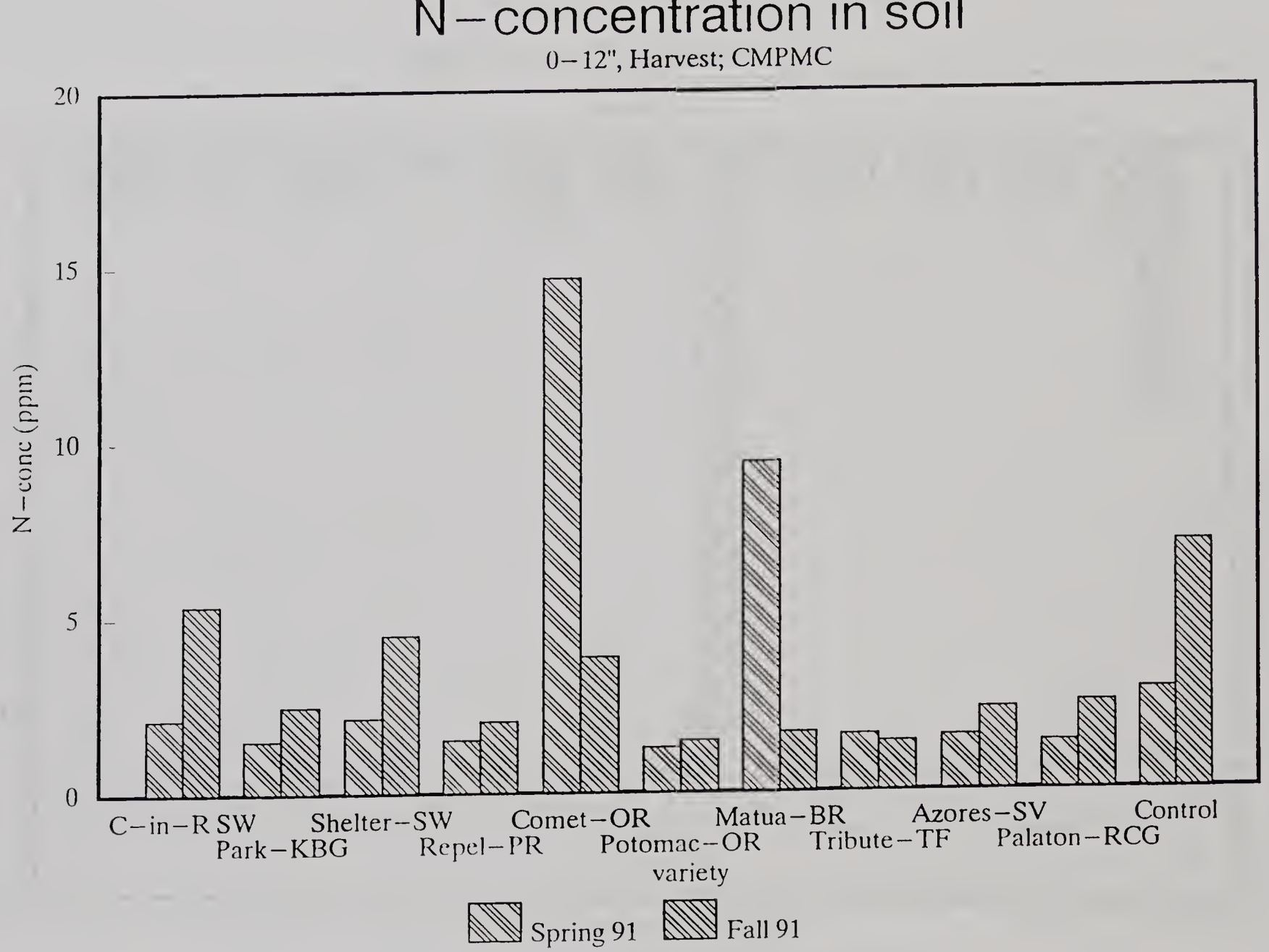

N–concentration in soil
0–12", Harvest; CMPMC
N–conc (ppm)
20
15
10
5
0
C–in–R SW
Park–KBG
Shelter–SW
Repel–PR
Comet–OR
Potomac–OR
Matua–BR
Tribute–TF
Azores–SV
Palaton–RCG
Control
variety
Spring 91
Fall 91

Fig. 4

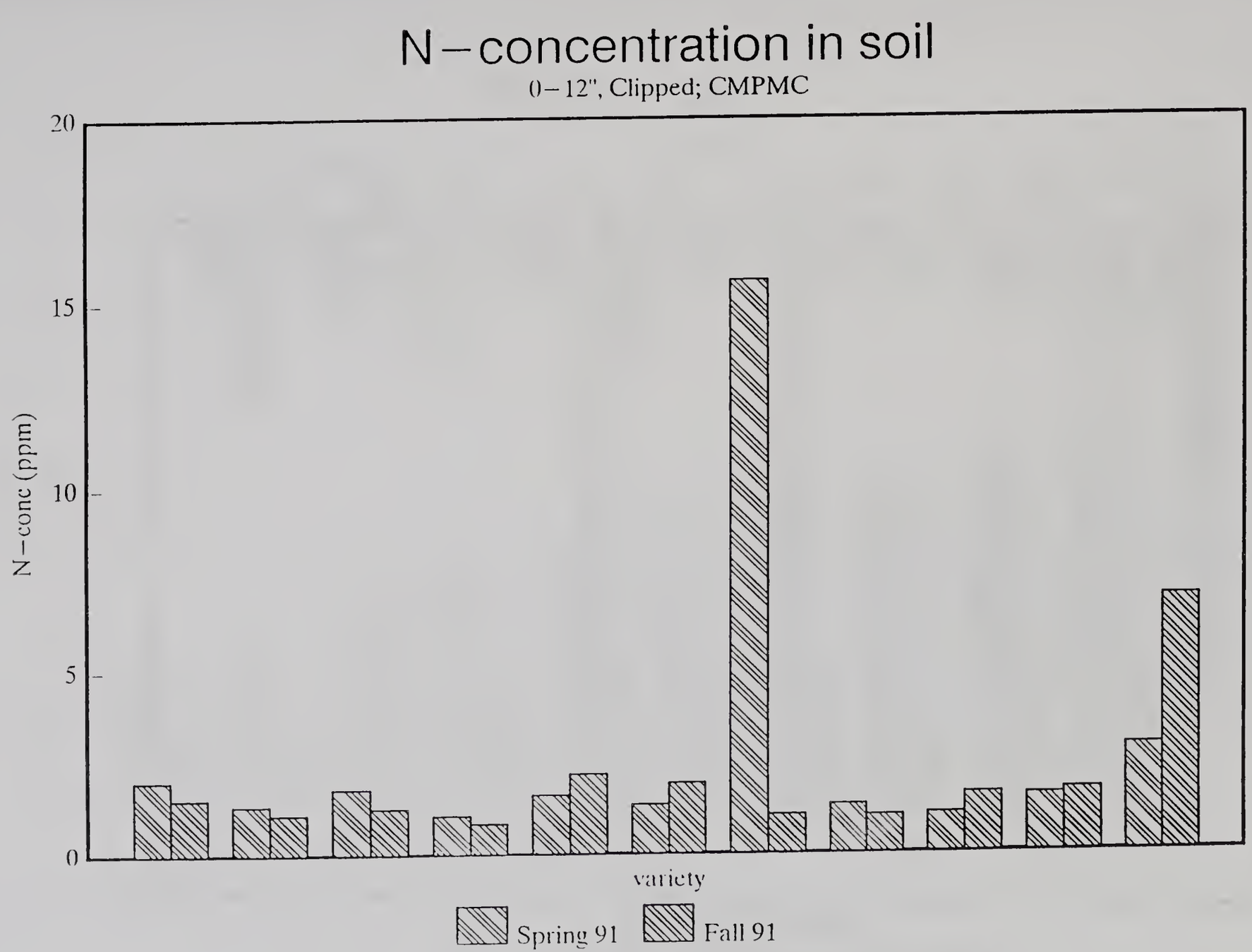

N−concentration in soil
0−12", Clipped; CMPMC
20
15
10
5
0
N−conc (ppm)
variety
Spring 91
Fall 91

Fig. 5

N–concentration in soil

12–24", Harvest; CMPMC

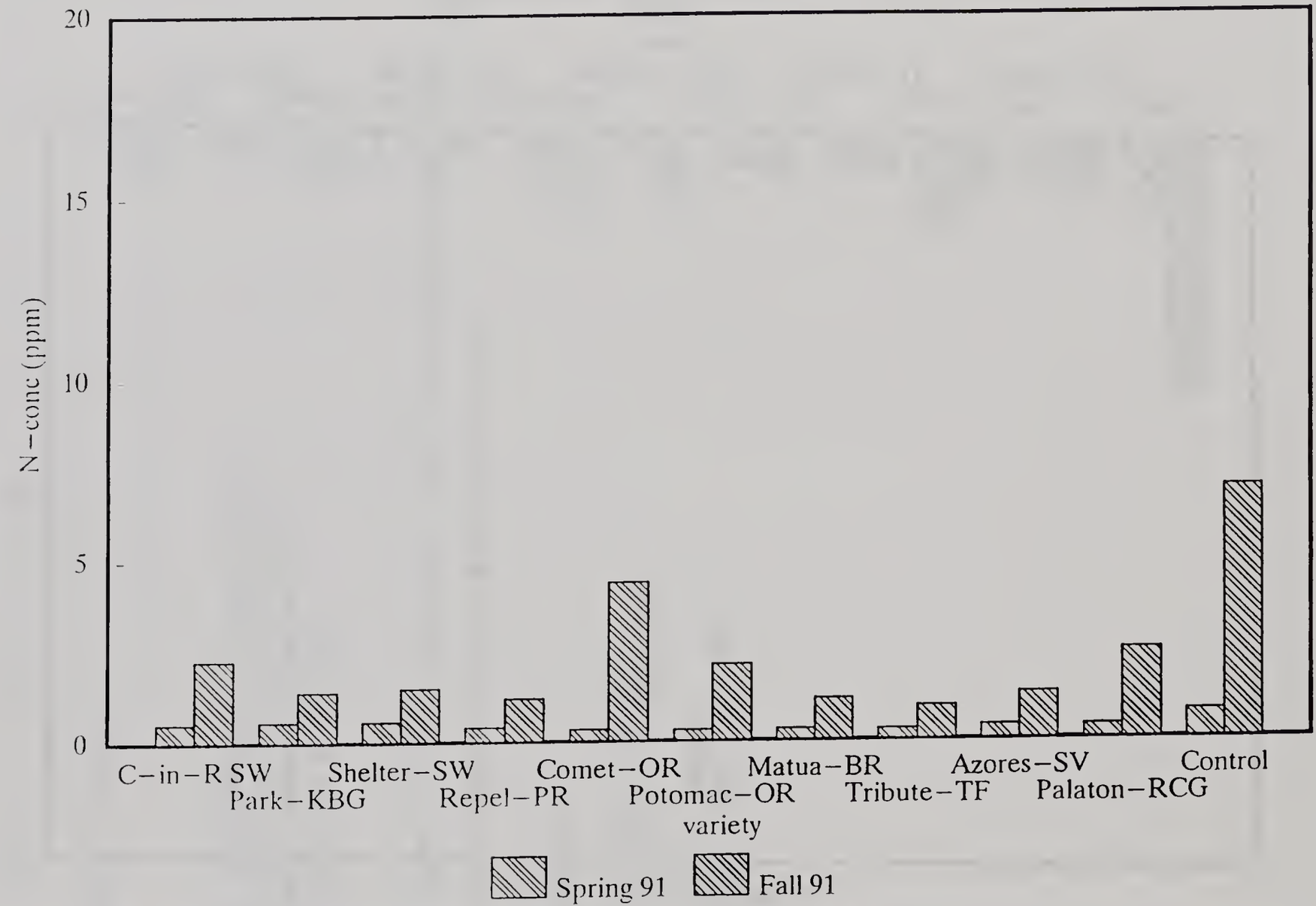


Fig. 6

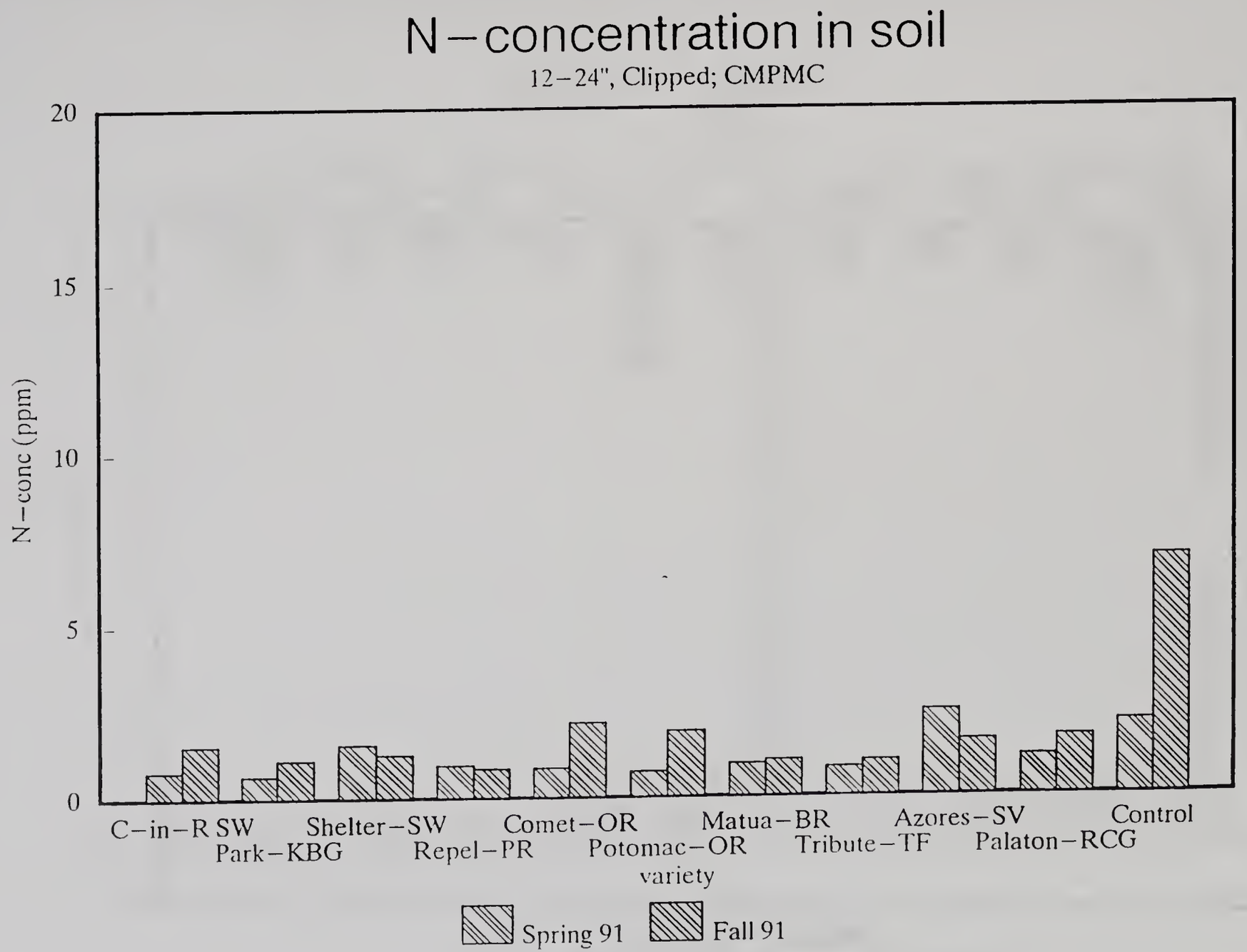

N–concentration in soil
12–24", Clipped; CMPMC
N–conc (ppm)
20
15
10
5
0
C–in–R SW
Park–KBG
Shelter–SW
Repel–PR
Comet–OR
Potomac–OR
Matua–BR
Tribute–TF
Azores–SV
Palaton–RCG
Control
variety
Spring 91
Fall 91

Fig. 7

United States
Department of
Agriculture

Soil
Conservation
Service

Cape May Plant Materials Center
1536 Route 9 N.
Cape May Court House, NJ 08210

August 5, 1993

U.S. Department of Agriculture
National Agricultural Library
Serials Branch, Room #002
Beltsville, MD 20705

Enclosed, please find your copy of the 1992 Annual Report for the Cape May Plant Materials Center.

Sincerely,

Donald W Hamer

Donald W. Hamer
Manager, Cape May PMC

enc.

INITIAL EVALUATION OF SWEET VERNALGRASS (*ANTHOXANTHUM ODORATUM*)

Nitrate leaching into ground and surface water is a major concern of recent times. This contamination can result from cropland practices, home lawn maintenance and animal waste disposal among other things. One approach of reducing nitrate contamination of ground and surface water is the use of plant species that have abiliities to uptake large amounts of nitrates. University research has shown that sweet vernalgrass (*Anthoxanthum odoratum*) is one such species. The objective of this initial evaluation of sweet vernalgrass is to identify and develop a superior cultivar for release, which can be utilized for vegetative filter strips.

An assembly of fifty-six accessions of sweet vernalgrass was planted into Field 2 of the Cape May PMC in September 1990. In 1992, 15 top accessions were chosen and seed was collected. The remaining accessions were rogued out.

The accessions were evaluated for survival, vigor, foliage abundance, cover, and relative rank. This grass will continue to be evaluated until a superior cultivar is chosen.

PROPAGATION TECHNIQUES for PERENNIAL WETLAND PLANT SPECIES of the MID-ATLANTIC REGION OF THE U.S.

Problem:

Land Use - wetland mitigation sites, artificial wetlands, ponds and natural wetland species diversity, and streambank stabilization

Resource Concerns - successful establishment of vegetation in wetland conditions; there is an increase of artificial wetland construction; it is thought that wetland plants take part in extracting excess nutrients from surface water

Conservation Practices Affected - constructed wetlands, storm water detention basins, manure mgt. systems, ponds, water-ways, natural wetland mgt., streambank protection, nutrient mgt. systems

Quantitative Magnitude - The states served by the CM-PMC have all expressed the lack of information pertaining to the establishment of vegetation in constructed wetlands. Wetland concerns are relatively new with many unanswered questions; the CM-PMC has the resources to investigate some of these questions.

Objective:

The identification of successful wetland plant propagation techniques and factors which limit success are the primary intent of this project with the possibility of Water Quality implications for certain species.

Advisory Committee Approval - October 23, 1991

Goal:

Develop and distribute Technical Notes explaining the proper procedure for successfully establishing wetland vegetation in constructed wetlands.

STUDY PLAN NO. 1

Initial Assembly of Ten Wetland Plant Species

Objective: Document the growth character of ten wetland plant species used in vegetating constructed wetlands.

Literature Search: March 1992

Location: Cape May PMC

Time Frame: Five year study starting in 1992

Plant Materials:

1. Ten species in study:

Alisma plantago-aquatica	(common water plantain)
Juncus effusus	(soft rush)
Peltandra virginica	(arrow arrum)
Phalaris arundinacea	(reed canarygrass)
Pontederia cordata	(pickerel weed)
Sagittaria latifolia	(duck potato)
Scirpus acutus	(hardstem bulrush)
Scirpus cyperinus	(wool grass)
Scirpus validus	(softstem bulrush)
Sparganium eurycarpum	(giant burreed)
Typha sp.	(cattail)

2. Assemble 30 units of each species of native and commercial origin (spring 1992)
3. All material will be assembled in the north pit of field 15 at the CM-PMC as an increase block (1993)
4. Planting Units:
   Planting units of commercial sources will be used in 1993 to establish standard of comparison

North Pit Preparation: (1992)

1. Level field to ensure uniform water depth in study
2. Plant oats as summer and winter cover crop; disc prior to seed formation

Plot Design:

1. 10 species
2. 30 plants per species
3. Plant Spacing:
   a. 6 in., 1 ft., 1 1/2 ft., 3 ft.
   b. between species: 6 ft.
4. Study Dimensions: ft. x ft.

Analysis / Evaluations:

1. Percent Survival
2. Vigor (1-9; 1=excellent)
3. Foliage Abundance (1-9; 1=very abundant)
4. % Cover (1-9; 1=91-100%)

5. Insect, Disease, & Frost Injury (1-9; 1=no injury)
6. Plant Dimensions:
   a. canopy width (cm)
   b. foliage height (cm)

Maintenance:

1. Apply 300lbs. of 10-10-10 fertilizer per acre in May
2. Weed Control- hand weed as needed

Reports:

1. Data will be recorded monthly from May through October
2. Annual Technical Summarization completed by December of each year
3. Enter summary in CM-PMC Annual Report to Field Offices
4. Enter Data on Computer

Staffing:

	Professional Hours	Technical Hours	Total Hours
Assembly*	35	0	35
Site Preparation	0	20	20
Planting	25	10	35
Evaluation	40	0	40
Maintenance	0	30	10
Reports	20	0	20
Total	120	60	180

* only scheduled for 1992

1992
SAND DUNE RESTORATION PROJECTS

1. INITIAL EVALUATION OF SEA OATS (UNIOLA PANICULATA)

2. WOODY PLANTS FOR SAND DUNE RESTORATION:
   a. FINAL REPORT OF BEACH PLUM (PRUNUS MARITIMA)
   b. FINAL REPORT OF BAYBERRY (MYRICA PENSYLVANICA)
   c. FINAL REPORT OF RUGOSA ROSE (ROSA RUGOSA)

3. EVALUATION OF AMERICAN BEACHGRASS (AMMOPHILA BREVILIGULATA) FOR LONGEVITY

4. EVALUATION OF BITTER PANICGRASS (PANICUM AMARUM) FOR SAND DUNE RESTORATION

5. EVALUATION OF SALTMEADOW CORDGRASS (SPARTINA PATENS) ON SAND DUNES

INITIAL EVALUATION OF SEA OATS (*UNIOLA PANICULATA*)

Sea oats (*Uniola paniculata*) is a warm season, perennial bunchgrass that is the dominant native foredune species of the coastal strand environment extending from Northampton County, Virginia south to Florida and the Dry Tortugas in the Caribbean and west to Texas and the Gulf states of Mexico. In addition to being dominant on the frontal dune, sea oats occur through the back dune and rear depressed areas of the coastal ecosystem, where they are commonly found with bitter panicgrass (*Panicum amarum*) and saltmeadow cordgrass (*Spartina patens*).

Both the above and below ground portions of sea oats help to trap and accumulate sand, resulting in small dunelets forming around the plants. As both the number of sea oats and the number of dunelets increase, a barrier is created against storm-generated waves. In addition, the spread of the plants' extensive rhizome system helps to prevent the deflation of existing dunes.

Many authors have noted that diverse planting mixtures are preferable over monocultures for promoting stand longevity, pest resistance, and the ability to withstand environmental degradation. Sea oats is considered to be excellent for companion planting with American beachgrass (*Ammophila breviligulata*) and bitter panicgrass (*Panicum amarum*). As consequence of sea oats being a warm-season (C4) grass and American beachgrass being cool-season (C3), mixed plantings offer a maximum amount of yearly growth and, hence, sand-binding ability. Although the increased rate of tillering for American beachgrass allows for faster establishment, sea oats tends to outlive and take over beachgrass plantings over time. Sea oats tends to remain more vigorous than does American beachgrass under conditions of reduced fresh sand accumulation. In addition, sea oats has been noted as much more resistant to marasmius blight than is American beachgrass, bitter panicgrass, or coastal panicgrass.

The Cape May PMC began the evaluation of sea oats in 1982 with the dual objective of selecting an ecotype with cold-tolerance and selecting/breeding an ecotype with superior vigor. Currently, there are 32 accessions located in various evaluation sites in Virginia, Delaware, and New Jersey. Twenty five (25) accessions were chosen in 1990 for evaluation for increased cold-tolerance. A twenty-sixth accession was added to the previous 25 selections after being bred in a random pollination nursery composed of several of the most promising ecotypes. In June of 1990, the 25 accessions were planted in a replicated evaluation for Northern range at Barnegat Light, New Jersey. A second replicated planting including all 26 potential cold-tolerant ecotypes was planted in Avalon, New Jersey during June of 1992.

Sixteen (16) ecotypes were chosen in 1990 for continued evaluation for superior vigor. Interestingly, all but six of the sixteen accessions were previously chosen for inclusion in the evaluation for Northern range. The sixteen ecotypes with potentially superior vigor were planted in June of 1991 in a replicated planting located at Delaware Seashore State Park.

The five best accessions of sea oats in the active projects include:

Original Accessions No./ 1/2-Sib Progeny Accession No.
9039033/9061202
9041959/9061173
9041976/9061181
9039013/9061168
9030201/9061165

These five accesisons were found in three or more of the five projects reviewed or were found in the top five of two projects. Since the winter of 1991-92 was relatively mild, most accessions experienced fair to good survival. The normal winters to come will truly test the northern adaptation and superior vigor of this southern dune species.

The 1992 Avalon, New Jersey planting was subjected to several days of tidal flooding during the storm of December 11, 1992. The results of the flooding allowed sand to be removed from the root zone of plants causing the roots to be exposed. As a result, the survival of this study is in question and will be revealed during the spring and summer of 1993.

Additional studies in 1993 will:

1.) Compare 26 cold-tolerant ecotypes in a replicated study on Long Island, New York.

2.) At the Cape May PMC, prepare a polycross of the top ten accessions in the superior vigor study to produce a broad genetic base cultivar with superior vigor for the mid-Atlantic region.

Sea Oat Accessions Included in the CM PMC Initial Evaluation for Northern Range and Superior Vigor

Original Acc. No. 1/	1/2-sib Progeny No. 2/	Original Collection Site	Included in Cold-Tolerance Evaluation 3/	Included in Superior Vigor Evaluation 4/
9027034	9061156	Back Bay, VA	yes	yes
9027035	9061157	VA Beach, VA	yes	yes
9027036	9061158	VA Beach, VA	no	yes
9030194	9061159	Cape Charles, VA	yes	yes
9030195	9061160	Accomack, VA	no	yes
9030199	9061163	VA Beach, VA	yes	no
9030201	9061165	VA Beach, VA	no	yes
9030203	9061167	VA Beach, VA	yes	no
9039013	9061168	Northampton, VA	yes	yes
9039031	9061169	Carteret, NC	yes	yes
9039033	9061202	Georgetown, SC	yes	yes
9039034	9061170	Georgetown, SC	yes	no
9039036	9061171	Georgetown, SC	no	yes
9039037	9061172	Georgetown, SC	no	yes
9041959	9061173	Charlestown, SC	yes	yes
9041960	9061243	Charlestown, SC	no	yes
9041961	9061174	Dare, NC	yes	no
9041969	9061203	Currituck, NC	yes	yes
9041970	9061175	Dare, NC	yes	no
9041971	9061176	Dare, NC	yes	no
9041972	9061177	Dare, NC	yes	no
9041973	9061178	Dare, NC	yes	no
9041974	9061179	Dare, NC	yes	no
9041975	9061180	Dare, NC	yes	no
9041976	9061181	VA Beach, VA	yes	yes
9041977	9061182	VA Beach, VA	yes	no
9041979	9061184	VA Beach, VA	yes	no
9041981	9061186	VA Beach, VA	yes	yes
9041983	9061188	VA Beach, VA	yes	no
9041984	9061189	VA Beach, VA	yes	no
9041985	9061190	VA Beach, VA	yes	no
9061242	-------	CM PMC Random-X Cape May, NJ	yes	no

1/ Represents the accession number assigned to ecotype at the time of initial collection.

2/ Represents the accession number assigned to 1/2-sib progeny from the original ecotype.

3/ Evaluation for cold-tolerance includes 26 accessions total.

4/ Evaluation for superior vigor includes 16 accessions total.

SHRUBS FOR the BACK DUNES

FINAL REPORT

As winter approaches the United States' eastern seaboard, so does the threat of violent coastal storms. For many residents and homeowners of these communities, it means the season when valuable assets and real estate can be lost if the frontal sand dunes fail to provide adequate protection against the ocean. Since the late 60's American beachgrass (Ammophila breviligulata) has been utilized extensively to stabilize the shifting sand dunes, forming a protective barrier between beach-front homes and the ocean. During intense storms the beachgrass can't stand up alone against the pounding forces of the ocean's waves; a rigid deep rooted plant would offer more protection.

In a natural undisturbed coastal sand dune ecosystem, shrubs inhabit the transition zone between climax forests and the frontal dune pioneer grasses, (i.e. American beachgrass). Over the past twenty-seven years, twenty shrub species have been observed, assembled, or screened for their use as back dune stabilizing plants at the USDA Soil Conservation Service's Cape May Plant Materials Center. Of the species evaluated at Cape May, bayberry {Myrica pensylvanica Loisel.), beach plum {Prunus maritima marsh.), and rugosa rose (Rosa rugosa Thunb.) were found to provide the best shrub cover in the back dune areas. All three species are now available to commercial for production.

'SANDY' RUGOSA ROSE

'Sandy' rugosa rose (Rosa rugosa Thumb.) originates from a cross of 12 superior strains that were selected from an assembly of 48 total seed accessions. These 12 strains were selected for their superior seedling vigor, survival, growth rate, foliage abundance, high level of insect and disease resistance, and good fruit production. Sandy has been field tested at sand dune locations from North Carolina to Massachusetts with good success. While the species Rosa rugosa is commonly found growing within USDA Plant Hardiness Zones 4b-8b, the cultivar Sandy is presently being recommended for use within zones 5b-8b.

The states of origin of these 12 superior strains that composes the make up of Sandy rugosa are Delaware, Maryland, Massachusetts, and New Jersey.

Description

'Sandy' rugosa rose is very adaptive with good tolerance to salt spray and droughty soil conditions. Since its growth is best on well drained, sandy soils, it performs extremely well as a shrubby stabilization plant on coastal sand dunes. Under these conditions, Sandy can attain heights of 1.2 m to 1.5 m.

Although deciduous, this erect shrub can offer year round sand dune protection due to its dense stem production character. The numerous stems produced by Sandy are covered with fine, sharp thorns. It has serrated, lustrous, dark green leaves which have a somewhat hairy underside. The leaves are also compound with five to nine thick leaflets.

Sandy rugosa rose has solitary white to purple flowers that are 5 cm to 7.6 cm in diameter. These colorful flowers are only produced by plants which are two years old and greater. The flowers give rise to bright orange to red fruit when ripe in mid to late summer. The fruit range from 1.9 cm to 3.2 cm in diameter. Within the leathery outer membrane of the fruit are many small, about 2.5 mm, swollen ovate seeds. In addition to reproducing by seed, Sandy rugosa rose slowly spreads by stout underground root suckers, forming dense thickets vegetatively.

The dense salt tolerant thickets, which form in only a few years, make this plant ideal for back dune stabilization. If such dense colonies develop when inter-planted with other dune shrubs, good protection can be ensured to adjacent coastal communities.

Conservation Use

While the positive physical erosion control characteristics of Sandy rugosa rose are its primary importance, it also has aesthetic attributes which may be desirable to some residential coastal communities.

When considered for planting around residential areas, Sandy has numerous applications. The aesthetic value of this shrub are obvious: dark green summer foliage and flowers which bloom most of the summer. By planting Sandy around residential areas, wildlife will be attracted providing a living bird feeder or birdhouse, as well as escape cover for both birds and mammals. If this same planting was established with close spacings, this shrub could be utilized as a living fence or included in a privacy screen.

'WILDWOOD' BAYBERRY

'Wildwood' bayberry (Myrica pensylvanica Loisel.) originates from a cross of four superior strains that were selected from an assembly of 86 total accessions. These four strains were selected for their exceptional seedling vigor, survival rate, foliage abundance, high level of insect and disease resistance, leaf retention, cold tolerance and growth rate. They have been field tested on coastal sand dune sites from Delaware to Massachusetts with little or no performance variation from that of the parent plant. While the species M. pensylvanica is commonly found growing within USDA Plant Hardiness Zone 3b-8b, the cultivar Wildwood is presently being recommended for use within zones 5a-8b.

The states of origin of these four superior strains that composes the genetic make up of Wildwood bayberry are New Jersey and North Carolina.

Description

Wildwood bayberry is an erect shrub with exceptionally good tolerance to salt spray. On coastal sand dunes, it will probably not exceed 1.8 m in height, while inland it will grow to heights of up to 2.4 m. Wildwood is a crooked multi-stemmed shrub with dark green foliage; leaves are alternate, simple, serrated, elliptic-obovate, and about 3.8 cm long.

Both leaves and fruit of Wildwood bayberry have a distinct appealing aroma; oils can be extracted from both to scent candles, potpourris, etc. Its waxy gray-white clusters of fruit (actually nutlets) are 3.5-4.5 mm in diameter and develop from inconspicuous flowers which bloom in early spring from second year stems. Male and female catkins are produced by separate plants, but the fruit only forms on the female plants. The fruit will remain attached to the stem well into the winter.

Once this shrub has become established, it will slowly spread vegetatively by rhizomes as well as viable seeds, forming dense thickets. The root system has nitrogen bearing nodules attached to it which aid in the plants development by synthesizing nitrogen for the plant to utilize; this characteristic helps Wildwood survive in stressed environments such as coastal sand dunes.

Conservation Use

When combined with pioneering type dune grasses (American beachgrass, coastal panicgrass, sea oats, bitter panicgrass, etc.), Wildwood bayberry can provide permanent back dune stabilization. Since bayberry can be considered one of the top wind and storm resistant native shrubs found growing along the east coast, an improved cultivar such as Wildwood has great promise in developing a durable permanent vegetative barrier to protect coastal communities.

Many of the characteristics possessed by Wildwood make it an essential and versatile plant for aiding the stabilizing of coastal sand dunes. Wildwood is well adapted to a wide range of sandy textured soils, but is less vigorous on heavy soils. Once established, its rhizomatous root system will quickly form dense and vigorous stands.

Although originally developed to protect coastal communities, Wildwood is not limited to its niche on the sand dunes. This cultivar has excellent late winter leaf and fruit retention; a noteworthy asset when utilized by land managers in wildlife plots. The retained foliage offers good protective and escape cover, while the fruit provide winter food to birds and mammals even with snow cover since the fruit are produced well off the ground. There are approximately thirty-five songbirds which will eat the fruit of Wildwood along with bobwhite quail, ruffed grouse, wild turkey, and ringneck pheasants.

In agricultural applications, Wildwood has the potential to be utilized as a medium sized windbreak and as field borders. Along public roads and highways, this plant can be utilized to form green corridors while providing good erosion control cover. When planted in residential areas, Wildwood will provide privacy screens, a medium textured landscape background, a dark green hedge that tolerates moderate trimming, and backyard wildlife cover.

'OCEAN VIEW' BEACH PLUM

'Ocean View' beach plum (Prunus maritima Marsh.) originates from a cross of four superior strains that were selected from an assembly of 28 total seed accessions. They were selected for their exceptional survival, seedling vigor, foliage abundance, high level of disease and insect resistance, leaf retention, fruit production and cold tolerance. Ocean View has been field tested on coastal sandy sites from North Carolina to Maine. While the species Prunus maritima is commonly found growing within USDA Plant Hardiness Zone 4b-8b, the cultivar Ocean View presently is being recommended for use within zones 5b-8b. The states of origin of these four superior strains are Delaware, New Jersey and Massachusetts.

Description

Ocean View is an upright, salt tolerant shrub which is densely branched. On sand dunes the lower branches are often buried by shifting sand and roots begin to develop from the branches, this is known as layering. From this layering effect, beach plum can spread up to 6 m. In a sand dune environment, this shrub rarely exceeds 2.1 m in height, while inland it can reach heights of up to 5.5 m.

Ocean View has pale green foliage with alternate leaf and branching character. The serrated leaves are elliptical to ovate in shape; they range from 3.8 cm to 6.4 cm long and half as wide. The underside of the leaves are covered with fine hairs and paler than above, while the upper surface is rough and ridged.

In early spring, before the leaf buds break, axillary clusters of snowy-white blooms emerge. These flowers are .6 cm to 1.9 cm in diameter, and cover the actively growing crown of the shrub. Prior to falling off, these flowers take on a pink hue. At about the time the flowers drop off, the leaves emerge, protecting the developing fruit.

The edible purplish-black to red fruit are 1.3 cm to 1.9 cm in diameter; they are covered with a heavy, white, waxy film to protect them from fungi and disease. The single pit, contained inside the drupe type fruit, is truncate at the base ovate and swollen. The fruit ripens on the shrub from August to October, but sometimes remains on the plant in the form of a raisin well into the winter months.

Conservation Use

In an attempt to avoid monocultures of any one species of dune shrub, a native drought tolerant plant such as Ocean View is ideal to plant with bayberry (Myrica pensylvanica) and other dominant shrub species. It offers a thicket forming growth character with

layering lower limbs to bind the back dune sands while producing edible fruit. It has great potential for diversifying the flora behind the foredune, and at the same time helps in the stabilization of those same sand dunes. When planted alone on an area without pre-existing dunes and vegetation, beach plum will establish with moderate success. Combine this shrub with pioneer dune grasses (American beachgrass, coastal panicgrass, sea oats, bitter panicgrass, etc.) in a sand dune rehabilitation system and within a few years this beach front area will become well vegetated and provide a high degree of protection from intense storms.

Ocean View is a multiple use type shrub. The characteristics which enable this shrub to perform well as a back dune stabilization plant also make it enticing for wildlife and residential use. Wildlife managers and enthusiasts of the Atlantic coastal plain will find Ocean View's full canopy and low persisting limbs to be useful escape cover and perches for songbirds, gamebirds, and small mammals. The succulent fruit which Ocean View produces is treasured in the fall by many bird species as well as small and medium size mammals. The foliage of beach plum are browsed by cotton tailed rabbits and white tailed deer. For bee-keepers, the dense early spring bloom of Ocean View's flowers can enhance early season honey production.

Planting Ocean View around residential areas will help attract wildlife into your backyard by providing a living bird feeder or birdhouse. The same planting of shrubs can be included in a privacy screen since it has dense foliage, or it can be utilized in the home landscape as an ornamental for its spring flowers and green foliage.

Table 1

Woody Plants for Sand Dune Stabilization[1]

34I006C

Myrica pensylvanica

1986

(1982 Planting)

Accession	Survival	Vigor[2]	Foliage Abundance[2]	Damage[3] I	Damage[3] D	Damage[3] F	Date of Bud Break	Date of Bloom Date	Fruit Prod.[2]	Plant Dimension Ht. (cm)	Plant Dimension W (cm)
9022749	60	3	3	1	3	1	4/22	5/5	4	195	220
9002750	20	5	4	1	3	1	"	"	4	213	211
9002751	60	4	3	1	3	1	"	"	5	196	198
9002752	60	4	4	1	3	1	"	"	7	202	214
9002753	53	5	4	1	3	1	"	"	4	186	186
9002755	66	5	5	1	3	1	"	"	4	185	215
9002759	90	3	3	1	3	1	"	"	4	205	190
9002760	73	4	4	1	3	1	"	"	3	173	192
9002763	66	5	5	1	3	1	"	"	4	169	200
9002764	33	4	4	1	3	1	"	"	7	187	197
9002765	6	5	5	1	3	1	"	"	5	165	175
9002767	46	4	3	1	3	1	"	"	3	201	195
9002768	80	3	3	1	3	1	"	"	5	222	211
9002770	33	4	4	1	3	1	"	"	7	222	205
9007613	100	3	3	1	3	1	"	"	4	200	199
9007639	46	4	4	1	3	1	"	"	4	177	226
9011232	6	4	4	1	3	1	"	"	10	190	190
9011235	93	7	7	1	3	1	"	"	3	146	191
9011238	66	4	3	1	3	1	"	"	4	207	217
9011243	80	4	4	1	3	1	"	"	3	190	217
9011244	60	4	4	1	3	1	"	"	4	185	175
9011245	66	3	4	1	3	1	"	"	2	186	194
9011267	73	4	4	1	3	1	"	"	2	122	185
9011272	86	5	5	1	3	1	"	"	3	174	211
9011273	66	5	6	1	3	1	"	"	3	178	217
9012007	60	4	5	1	3	1	"	"	5	188	222
9012008	86	3	3	1	3	1	"	"	2	216	215
9012012	26	4	5	1	3	1	"	"	7	195	227
434155	33	4	4	1	3	1	"	"	5	195	229
434150	73	3	2	1	3	1	"	"	3	213	305
434151	53	4	4	1	3	1	"	"	3	185	212
434152	40	4	5	1	3	1	"	"	3	192	244
434159	33	5	6	1	3	1	"	"	5	176	207

1 1982 planting of Myrica pensylvanica in F-5&6 of the Cape May PMC; 1986 data.
2 Ratings: 1-9; 1=Excellent; 9=Very Poor.
3 Ratings: 1-9; 1=No Damage; 9=Severe Damage.

Table 2

Woody Plants for Sand Dune Stabilization[1]

34I006C

Myrica pensylvanica

1992

Brigantine, NJ
(1991 Planting)

Accession	Survival	Vigor[2]	Foliage Abundance[2]	Damage[3] I[4]	Damage[3] D[4]	Damage[3] F[4]	Plant Dimension (cm) Ht.	Plant Dimension (cm) W	Plant Dimension (cm) Stem
548964	25	4	6	1	2	2	28	21	8
548965	55	3	3	2	1	1	30	34	9
548966	10	4	3	1	1	1	26	18	9
434150	15	3	4	1	1	1	24	23	8

1 1981 planting of Myrica pensylvanica in F-5&6 of the Cape May PMC; 1982 data.
2 Ratings 1-9; 1=Excellent; 9=Very Poor.
3 Ratings 1-9; 1=No Damage; 9=Severe Damage.
4 I=Insect; D=Disease; F=Frost

Table 3

Woody Plants for Sand Dune Stabilization, 1981[1]

34I006C

Species	Acc. No.	Percent Survival	Source	Height (cm)	Width (cm)	Vigor[3]	Insect Damage[2]
Prunus maritima	9013172	100	NY	110	105	4	M-Se
	9007614	100	NJ	130	135	2	M
	9007632	100	NJ	109	100	4	M
	9007634	100	MA	90	82	4	Sl-M
	9009192	100	DE	117	92	4	Sl-M
	9009193	100	MA	120	107	5	M
	9009200	100	DE	125	121	3	M
	9009204	100	DE	130	120	4	Sl-M
	9011246	100	MA	113	98	5	Sl-M
	9011248	100	MA	62	130	5	Sl
	9011249	100	MA	83	105	6	Sl-M
	9011250	100	MA	118	118	4	Sl-M
	9011251	100	DE	142	125	3	Sl-M
	9011252	100	NJ	130	118	4	M
	9011275	100	NJ	150	140	2	Sl-M
	9012013	100	DE	140	140	3	Sl-M

1 1981 planting of Prunus maritima in F-5&6 of the Cape May PMC; 1981 Data.
2 Ratings: 1-9; 1=No Damage; 9=Severe Damage.
3 Ratings: 1-9; 1=Excellent; 9=Very Poor.

Table 4

Woody Plants for Sand Dune Stabilization[1]

34I006C

Prunus maritima

1985
(4 Yr. Old) (1981 Planting)

Acc.	Sur. (%)	Vigor[2]	Foliage Abund.[2]	Damage[3] I	D	F	Date of Bud Break	Bloom Date	Fruit Prod.[2]	Fruit Matur. Date	Plant Dimension Ht. (cm)	W (cm)
9013172	100	3	4	3	3	1	4/19	4/22	3	8/5	248	296
9007614	93	4	5	3	2	2	4/19	4/22	3	8/30	199	313
9007632	80	4	7	3	3	5	4/19	4/22	5	8/16	281	222
9007634	100	5	6	3	2	1	4/19	4/22	3	8/5	174	253
9009192	100	3	4	3	2	1	4/19	4/22	4	8/16	235	334
9009193	100	4	5	3	2	1	4/19	4/25	4	8/5	228	221
9009200	100	4	4	3	3	1	4/19	4/22	4	8/26	221	250
9009204	100	3	4	4	3	1	4/19	4/22	5	8/26	236	264
9011246	93	4	6	3	3	2	4/16	4/25	3	8/16	205	271
9011248	33	8	9	3	2	3	4/22	4/29	9	8/16	101	169
9011249	100	7	8	3	4	1	4/14	4/25	6	8/5	130	2007
9011250	100	4	6	3	3	1	4/19	4/25	4	8/16	188	285
9011251	100	2	2	3	2	1	4/16	4/22	3	8/26	304	291
9011252	100	4	4	3	2	1	4/19	4/22	5	8/30	196	242
9011275	100	3	4	4	3	1	4/16	4/22	3	8/30	248	306
9012013	100	3	3	4	3	1	4/16	4/22	5	8/30	275	375

1 1985 planting of Prunus maritima in F-5&6 of the Cape May PMC; 1986 data.
2 Ratings: 1-9; 1=Excellent; 9=Very Poor.
3 Ratings: 1-9; 1=No Damage; 9=Severe Damage.

Table 5

Woody Plants for Sand Dune Stabilization[1]

34I006C

Prunus maritima

1992
(1987 Planting)

Acc.	Sur. (%)	Vigor[2]	Foliage Abund.[2]	Damage[3] I	D	F	Date of Bud Break	Bloom Date	Fruit Prod.[2]	Fruit Matur. Date	Plant Dimension Ht. (cm)	W	D
9013172	25	3	4	3	4				5		50	55	13
9011251	70	3	2	?	3				5		59	115	15
9012013	50	4	3	3	4				8		68	98	18
9011275	55	4	3	4	5				7		59	95	19

1 1987 planting of Prunus maritima in F-5&6 of the Cape May PMC; 1992 data.
2 Ratings: 1-9; 1=Excellent; 9=Very Poor.
3 Ratings: 1-9; 1=No Damage; 9=Severe Damage.

Table 6

Woody Plants for Sand Dune Stabilization[1]

34I006C

Rosa rugosa

1984

(1981 Planting)

Accession	Survival No.	Survival %	Vigor[2]	Foliage Abundance[2]	Damage[3] I[4]	Damage[3] D[4]	Damage[3] F[4]	Date of Bud Break	Date of Bloom Date	Fruit Prod.[2]	Fruit Maturity Date[2]
9002787	90		2	3	2	1	1	3/21	5/21	4	7/17
9002788	15=100		5	5	2	1	1	3/23	5/21	3	7/17
9007078	15=100		4	4	2	1	1	3/23	5/21	7	7/17
9007640	15=100		5	6	2	1	1	3/26	5/22	5	7/17
9008305	8=100		5	6	2	1	1	3/23	5/22	5	7/17
9008307	14/93		6	6	2	1	1	3/23	5/21	5	7/17
9008308	14/93		7	7	2	1	1	3/23	5/22	5	7/17
9008309	15=100		4	3	2	1	1	3/21	5/21	4	7/17
9008310	15=100		3	2	2	1	1	3/23	5/23	4	7/22
9008311	15=100		3	2	2	1	1	3/23	5/22	4	7/17
9011255	15=100		2	2	2	1	1	3/21	5/23	3	7/22
9011256	15=100		2	2	2	1	1	3/23	5/24	4	7/22
9011257	15=100		3	3	2	1	1	3/21	5/23	4	7/17
9011258	15=100		3	3	2	1	1	3/23	5/23	4	7/17
9011260	15=100		2	2	2	1	1	3/21	5/24	4	7/22
9011261	15=100		3	2	2	1	1	3/20	5/24	4	7/17
9011278	15=100		3	3	2	1	1	3/20	5/24	4	7/17
9012017	15=100		4	4	2	1	1	3/23	5/25	6	7/20
9012018	15=100		3	3	2	1	1	3/23	5/24	4	7/17
9015508	15=100		3	3	2	1	1	3/23	5/24	4	7/17
9015509	14/93		2	2	2	1	1	3/21	5/25	4	7/22
9015510	15=100		2	2	2	1	1	3/21	5/25	5	7/17
9030188	2=40		4	4	2	1	1	3/21	5/25	4	7/17

1 1981 planting of Rosa rugosa in F-5&6 of the Cape May PMC; 1984 data.
2 Ratings: 1-9; 1=Excellent; 9=Very Poor.
3 Ratings: 1-9; 1=No Damage; 9=Severe Damage.
4 I=Insect; D=Disease; F=Frost

Table 7

Woody Plants for Sand Dune Stabilization[1]

34I006C

Myrica pensylvanica

(1982 Planting)

Accession	Average Height (cm)	Width (cm)	Caliper (mm)	Percent Survival	Vigor[2]	Insec Damag[3]
9002749	40	32	6	93	6	5
9002750	38	30	8	100	5	6
9002751	28	22	5	100	5	5
9002752	30	28	5	93	6	5
9002753	25	35	6	73	5	5
9002754	28	25	4	100	6	5
9002755	20	15	3	100	6	6
9002756	18	22	2	100	6	5
9002757	35	28	5	87	6	6
9002759	25	32	5	90	5	4
9002760	32	29	4	100	5	5
9002761	25	25	4	71	6	5
9002762	22	20	3	73	8	8
9002763	42	28	7	93	5	6
9002764	28	18	6	93	6	5
9002765	32	28	6	67	7	7
9002766	32	28	6	93	6	6
9002767	30	18	5	100	5	5
9002768	35	20	4	100	6	6
9002769	38	30	5	93	5	6
9002770	22	25	3	100	7	7
9007613	25	22	4	93	5	6
9007638	25	28	6	73	5	6
9009194	15	15	2	73	7	5
9009195	10	15	2	87	7	5
9009196	18	25	2	67	7	4
9009197	18	25	4	73	6	5
9009198	20	12	3	87	6	5
9007639	32	28	6	100	5	6
9009201	15	10	2	87	6	5
9009202	28	25	4	93	6	2
9009203	22	15	3	93	7	8
9008398	15	15	2	100	7	7
9008299	5	5	2	80	7	5
9008300	12	18	3	80	6	6
9008301	18	18	4	100	7	7
9008302	15	15	6	87	7	5
9011232	18	10	3	80	6	6
9011233	22	25	3	93	5	5
9011234	22	22	3	93	6	7
9011235	25	20	4	93	5	7
9011236	25	20	4	93	5	7
9011237	20	20	4	100	6	7
9011238	20	15	3	80	5	6

Table 7

Woody Plants for Sand Dune Stabilization

34I006C

Myrica pensylvanica

(1982 Planting)

Accession	Average Height (cm)	Width (cm)	Caliper (mm)	Percent Survival	Vigor [4]	Insect Damage [5]
9011239	20	18	4	67	7	6
9011240	38	40	9	43	6	5
9011275	-	-	-	0	10	1
9011231	18	20	3	33	8	4
9011241	38	25	6	100	4	5
9011242	48	32	8	100	4	3
9011243	48	28	8	100	3	3
9011244	48	28	8	100	4	4
9011245	50	25	8	100	4	4
9011266	52	32	9	100	3	5
9011267	35	20	6	100	3	5
9011272	50	32	9	100	3	3
9011273	45	30	6	100	3	4
9012007	42	42	9	100	4	3
9012008	32	35	8	87	4	5
9012009	35	25	7	100	4	6
9012010	22	20	7	100	4	4
9012011	28	20	4	100	4	5
9014667	5	5	3	25	9	1
9000086	20	25	4	100	5	5
9012410	15	15	2	100	6	6
9012411	12	15	2	100	6	6
9012012	18	18	4	93	6	6
434153	18	12	4	75	7	3
434154	23 [4]	27 [4]	4 [4]	70	7	6
434155	22	12	4	80	6	5
434156	18 [4]	15 [4]	6 [4]	57	7	2
434157	22 [4]	24 [4]	5 [4]	23	7	2
9013170	15	15	4	46	7	5
9013171	15	12	2	53	7	5
434150	48	35	10	100	4	3
434151	52	38	8	87	4	4
434152	48	40	8	60	4	3
434154	6	- [5]	- [5]	33	6	3
434156	- [5]	- [5]	- [5]	0	10	1
434157	- [5]	- [5]	- [5]	60	6	5
4343159	40	30	8	73	5	5

1 Fifteen or less plants per accession planted from March 20-April 16; Data recorded from June 9 to June 28.
2 Ratings: 1-9; 1=Excellent; 9=Very Poor.
3 Ratings: 1-9; 1=No Damage; 9=Severe Damage.
4 Average of both rows of this accession.
5 See footnote 4/ for average of these accessions.

Table 8

Woody Plants for Sand Dune Stabilization[1]

34I006C

Rosa rugosa

1981
(1981 Planting)

Accession	Percent Survival	Fruit Prod.[2]	Source	Ht. (cm)	Width (cm)	Caliper (mm)	Vigor[2]	Insect Damage[3]
9002786	100	3	DE	43	85	6	4	Sl
9002787	90	7	NJ	25	85	5	6	Sl-M
9002788	100	2	DE	45	75	5	4	Sl
9007078	100	4	-	48	75	6	5	Sl
9007640	100	4	DE	47	75	7	5	Sl
9008303	100	5	MA	35	70	6	6	N
9008304	100	5	MA	44	92	6	5	Sl
9008305	100	5	MA	40	85	6	5	Sl
9008306	100	6	MA	43	80	5	5	Sl
9008307	100	5	MA	36	72	7	6	N
9008308	100	4	MA	40	68	6	6	Sl
9008309	100	3	MA	46	78	7	5	N
9008310	100	5	MA	42	80	6	5	N
9008311	100	5	MA	35	77	6	6	Sl
9009191	100	5	DE	47	90	8	5	Sl
9011254	100	5	NJ	46	80	8	6	M
9011255	100	5	NJ	38	80	5	4	Sl
9011256	100	4	NJ	62	88	6	3	Sl
9011257	100	3	NJ	45	82	7	5	Sl
9011258	100	3	VA	48	84	8	4	M
9011259	100	4	VA	42	73	4	5	M
9011260	100	5	MD	46	83	4	4	Sl
9011261	100	3	DE	53	80	7	4	Sl-M
9011276	100	3	NJ	52	90	6	2	M
9011277	100	2	NJ	42	88	5	3	M
9011278	100	3	NJ	42	80	3	3	N
9011279	100	3	WI	48	90	6	4	Sl
9011280	100	3	WI	50	86	4	5	Sl
9011281	100	3	RI	50	80	4	4	Sl
9012014	93	4	NC	44	80	6	5	Sl
9012015	100	4	DE	36	74	5	5	Sl
9012016	100	4	NY	47	80	7	4	Sl
9012017	100	6	NY	55	82	5	3	Sl
9012018	100	3	NY	48	90	3	3	Sl
9015508	100	4	MA	50	92	5	3	Sl-M
9015509	93	5	NJ	54	80	7	5	Sl
9015510	100	6	NJ	55	80	5	5	Sl-M
9030188	100	2	DE	47	70	6	4	M

1 1981 planting of Rosa rugosa in F-5&6 of the Cape May PMC; 1981 data.
2 Ratings: 1-9; 1=Excellent; 9=Very Poor.
3 Ratings: Sl=Slight; M=Moderate; N=None.

EVALUATION OF AMERICAN BEACHGRASS (*AMMOPHILA BREVILIGULATA*) FOR LONGEVITY

American beachgrass (*Ammophila breviligulata*) is the dominant foredune plant from Virginia north to Nova Scotia. In addition, American beachgrass is also the species used most for the initial stabilization of the frontal dune portion of the Mid-Atlantic coast. Released from the Cape May PMC in 1972, the cultivar 'Cape' is considered to be superior for restoration use north of the Chesapeake Bay. However, many American beachgrass stands have exhibited a decline in vigor and eventual die-out in some sites despite proper management. The decline and subsequent die-off have been attributed to both insect and disease, but the exact cause of the problem has yet to be determined. As such, the purpose of this project is to compare Cape against other accessions of American beachgrass to note their relative longevity and growth form. It is hoped, that from this comparison, an ecotype can be found or bred that exhibits greater longevity and retains the superior vigor and growth attributes associated with Cape.

Seven (7) accessions are currently involved in the evaluation, including the cultivars Cape, 'Hatteras', and 'Bogue' as well as accessions 9047071, 9047072, 9047073, and 9047085. Hatteras, Bogue, 9047071, and 9047072 originated from the Carolinas, while 9047073 and 9047085 were collected from sites in Virginia Beach, Virginia. Cape American beachgrass was collected in 1965 from Barnstable County, Massachusetts. The 1992 active plantings currently include off-center sites at Back Bay Wildlife Refuge in Sandbridge, Virginia and Brigantine, New Jersey . In addition, the following plantings were established in 1990 on the Cape May PMC:

1.) A replicated comparison of the included accessions for longevity; and

2.) A random crossing block for the development of an additional accession with the potential for increased longevity.

To date, our initial observations suggest that although Cape American beachgrass has an extremely rapid rate of establishment, several of the recent collections may have a greater longevity and/or disease resistance.

In the random crossing block, six of the seven accessions produced seed. The plants from this seed will be grown in an observation nursery at the center during 1993. It is hoped a superior genotype(s) will be identified from this material.

EVALUATION OF BITTER PANICGRASS (*PANICUM AMARUM*) FOR SAND DUNE RESTORATION

Recognizing the longevity problem found in stands of American beachgrass (*Ammophila breviligulata*), the staff of the Cape May PMC began searching for native grasses which grow in association with American beachgrass. In 1983, an assembly of bitter panicgrass (*Panicum amarum*) was made to test its performance on sites where American beachgrass had died out. Bitter panicgrass is a perennial warm season grass that is ideal for complimenting the cool season character of American beachgrass. This vegetatively established dune grass has semi-prostrate growth form and spreads by means of rhizomes; it has excellent sand stabilizing properties. The primary objective of this study is to identify a superior accession of bitter panicgrass that is adapted to the coastal sand dunes of the northeastern and southern United States.

Since the initiation of an assembly in 1983, the number of accessions has dropped from 57 to 3. In current evaluations, the cultivar 'Ocracoke' is used as the commercial standard for comparison. The accessions 515948, 518820, 518821 and Ocracoke are currently being increased at the Cape May PMC for off-center trials. These accessions are currently being evaluated by the area Plant Materials Specialists and the PMC Staff at several off-center locations.

One off-center planting is located at Brigantine Beach, New Jersey. This planting is comprised of two replications of the three accessions under evaluation as well as Ocracoke. This site is a beach front area which is periodically flooded by the high tides. Standing water has been observed in this planting after such flood events. The initial evaluation results reflect the known fact that bitter panicgrass does not tolerate wet soil conditions. High mortality was found where water had ponded for more than 24 hours.

Since its establishment in 1990, much sand has accumulated around and in the planting eliminating the flood threat witnessed in the first year. Of the two replications, only Rep I has all four accessions surviving. In Rep II, there are only two accessions surviving due to previous flood damage. The true test of this planting came the fall of 1991 when strong northeast storms flooded the New Jersey coastline.

Early in the spring of 1992, the durability and toughness of this plant was observed. Although the storms from the prior fall/winter season had hindered the accurate identification of individual accessions, over 50% of the planting grew back. The selection of the best adapted accession will be chosen in 1993 and released as a superior cultivar soon after.

EVALUATION OF SALTMEADOW CORDGRASS (*SPARTINA PATENS*) FOR DUNE RESTORATION

The detection of decline in the health of American beachgrass (*Ammophila breviligulata*) stands on coastal sand dunes has prompted the realization that pure stands of American beachgrass are not safe from an erosion protection stand-point. A complex of associated herbaceous dune species would be preferred. Such combinations would provide continuous stabilization in the event that pathogens were to reduce or eliminate the effectiveness of one species. The success of saltmeadow cordgrass (*Spartina patens*), as part of such a complex, is being evaluated at three locations in Delaware and New Jersey. It is hoped that this native of the backdune area can survive on the shifting sands of the foredune. This species of cordgrass is very salt and drought tolerant.

At Brigantine Beach, New Jersey, a planting of saltmeadow cordgrass accession 421250 was installed in mid-April, 1990. It was located approximately 150 feet from the surf on a level area of the beach. On the nearby dunes, the predominant native species was American beachgrass. This planting consisted of two replications of 72 saltmeadow cordgrass plants which were surrounded by two border rows of American beachgrass. The last evaluation performed on this planting in 1990 yielded an average rate of 83 percent survival and a moderate rating for foliage production. In 1992, the stand had begun to fill in with good vigor and accumulated 2.3 feet of sand.

With the preliminary success at Brigantine, New Jersey, two additional plantings of saltmeadow cordgrass on the foredunes were installed in 1992 on sites at Delaware State Seashore Park south of Dewey Beach, Delaware and in Avalon, New Jersey. Besides accession 421250, accessions 421237, 421238 and native material collected from adjacent sand dunes were planted for comparison in June 1992. This proved to be too late as the plants either died or had poor performance. Two new plantings will be made in the spring of 1993.

1992 COVER CROP PROJECTS

1. FINAL REPORT OF WINTER COVER CROPS

2. INITIAL EVALUATION OF EASTERN GAMAGRASS (*TRIPSACUM DACTYLOIDES*)

3. INITIAL EVALUATION OF SAINFOIN (*ONOBRYCHIS VICIAFOLIA*)

4. INITIAL EVALUATION OF SUBTERRANEAN CLOVER (*TRIFOLIUM SUBTERRANEUM*)

EVALUATION OF WINTER COVER CROPS

FINAL REPORT

Wind and water erosion causes damage to young crops as well as a deterioration of the soil resource. Conventionally tilled soybeans, peanuts, late maturing vegetables and several other crops produce insufficient residue for satisfactory winter time soil cover. Some crops are harvested after recommended seeding dates for cover crops. 'Aroostook' rye best fits this need but late seeded fields usually do not have adequate winter cover. Ideally, a nitrogen producing legume, that can be overseeded into a standing crop without interfering with harvest operations, while producing satisfactory soil cover before cold temperatures slow plant growth, is needed. A grass or legume that can be seeded after harvest of the main crop, yet, will provide good soil protection before cold temperatures is desirable. The objective of this study was to screen various annual grasses and legumes for use as a cover crop on tilled cropland.

The initial screening in 1983 contained 1,200 accessions of annual grasses, legumes, and forb species collected from a wide range of areas (Table 1). In 1987, ten of the 1,200 accessions were selected for further testing due to their good stand production, vigor, ground cover, foliage abundance, and resistance to cold temperatures. The most promising cover crop species included three brome grasses (Bromus), one ryegrass (Lolium), two brassicas (Brassica), and one annual rattail fescue (Vulpia). A decision was made to bulk several of the accessions of four species. Clean seed from the top five accessions of field brome (Bromus arvesnsis) was bulked in equal amounts and assigned a new accession number. This also took place to B. ciliatus and down chess (B. tectorum), although this latter was a bulk of four accessions. In addition, perennial ryegrass (Lolium perenne ssp. multiflorum) was also bulked from the best four accessions.

From 1989-91, the cover crop planting included three planting dates. This was carried out to determine the latest possible date that will give an acceptable ground cover of these species. The ten accessions were planted and included the six species from the initial increase, two accessions of rattail fescue (V. myuros), Aroostook and 'Syn-T' cereal rye (Secale cereale). Syn-T was dropped in 1991 because of possible contamination of Aroostook production fields. The cover crops were planted into 6 x 10 ft. replicated plots. The planting dates were: September 15, October 13 and 27, 1989; September 5 and 26 and October 16, 1990; September 13, October 2 and October 17, 1991. Tables 2-4 show the average winter measurements of the plots.

As one would expect, the cover crops that were planted at the earliest date in September produced better growth and, in most cases, had better resistance to cold than the cover crops planted at the two later dates. Most of the cover crops planted at the latest date of mid to late October produced little growth before winter set in and, therefore, performed poorly as cover crops. September and early October cover crop plantings are acceptable at Cape May, New Jersey for most of the cover crops in this study. Mid-October plantings have varied success depending on species and weather. The late October planting of 1989 was unsuccessful at producing an adequate cover crop.

The top rated cover crop for this study was Aroostook cereal rye followed by perennial ryegrass, Syn-T cereal rye, and field brome. The lowest rated cover crops were the two rattail fescues and the two brassicas. The remaining bromes, down chess, and Bromus ciliatus were mediocre in performance.

Cereal rye is a standard cover crop in the northeast. It germinates and grows quickly. By spring tillage, though, it may have grown to a point, whereby, it is difficult to turn under. In addition, the amount of vegetative material being incorporated may be excessive. Perennial ryegrass, one of the top rated winter cover crops of this study, is a sod former and may also present problems during spring plowing. Possible alternatives to these two cover crops are the brome grasses, in particular, field brome (Bromus arvensis). The foliage abundance is not as high as the cereal rye or perennial ryegrass and if it is plowed in or mowed before heading, the weed problem it may present is avoided. The two brassicas produced initial ground cover but the cold winter temperatures tended to "melt" the foliage. These plants flower and set seed early and can easily become a weed problem. The two rattail fescues are slower to establish and should be planted as early as possible. They do not grow very tall by winter time but are resistant to the cold.

In conclusion, the standard cover crop of cereal rye was proven the best in this study. Alternatives can be suggested, though. Perennial ryegrass and field brome both performed well. Planting dates of September to early October provide the best cover crops in southern New Jersey. Mid October planting date success depends on the species and the weather. Late October plantings are unadvisable.

Table 1

Grass, Legume and Forb Species in Cover Crop Assembly, 1983, Cape May PMC

GRASSES	LEGUMES	FORBS
Agrostis tenuis	*Lathyrus* spp.	*Brassica* spp.
Bromus spp.	*Lupinus aridus*	*Sinapis* spp.
Lolium spp.	*Medicago* spp.	*Stellaria media*
Vulpia myuros	*Trifolium* spp.	
	Vicia spp.	

Table 2

Average Winter Measurements of Stand, Foliage Abundance, Percent Cover, Vigor, Resistance to Cold and Foliage Height for Ten Accessions of Cover Crops with Three Planting Dates in 1989 at Cape May PMC

Acc.[1]	Stand[2]			Foliage Abund.[3]			Percent Cover			Vigor[4]			Resistance to Cold[5]			Foliage Height (cm)		
	A[6]	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
SECE1	2	3	5	1	4	6	91	43	29	2	4	6	3	3	4	15	6	4
SECE2	3	3	7	1	4	8	89	33	7	1	4	6	3	3	5	20	7	4
BRAR	2	3	4	3	6	7	92	32	16	3	6	8	2	3	4	7	8	3
BRCI	3	3	6	3	6	8	69	20	6	4	6	9	2	2	4	5	4	2
BRTE	3	3	5	4	6	8	71	21	7	4	7	8	2	2	4	7	3	2
LOPEM	2	3	4	2	5	7	92	40	13	3	5	8	3	3	4	11	6	3
VUMY1	3	3	8	4	5	9	48	9	2	5	5	8	2	2	6	6	3	2
VUMY2	3	6	9	4	5	9	57	7	2	4	7	9	3	4	7	6	3	2
BRPE	3	4	7	2	6	9	83	26	4	3	6	9	5	5	7	8	3	1
BRSP	3	3	7	2	6	9	87	27	4	3	6	9	6	6	7	6	2	1

1 SECE1=Secale cereale 'Aroostook'; SECE2=S. cereale 'Syn-T'; BRAR=Bromus arvensis; BRCI=B. ciliatus; BRTE=B. tectorum; LOPEM=Lolium perenne ssp. multiflorum; VUMY1=Vulpia myuros Acc. No. 9041991; VUMY2=V. myuros Acc. No. 9041993; BRPE=Brassica pekinensis; BRSP=Brassica spp.

2 Ratings: 1-9; 1=Excellent; 9-Very Poor.

3 Ratings: 1-9; 1=Most Abundant; 9=Least Abundant.

4 Ratings: 1-9; 1=Most Abundant; 9=Least Abundant.

5 Ratings: 1-9; 1=Most Resistance; 9=Least Resistance

6 A=Planting Date - September 15, 1989; B=Planting Date - October 13, 1989; C= Planting Date - October 27, 1989; Data recorded December 1989-February 1990.

Table 3

Average Winter Measurements of Stand, Foliage Abundance, Percent Cover, Vigor, Resistance to Cold and Foliage Height for Ten Accessions of Cover Crops with Three Planting Dates in 1990 at Cape May PMC

Acc.[1]	Stand[2]			Foliage Abund.[3]			Percent Cover			Vigor[4]			Resistance to Cold[5]			Foliage Height (cm)		
[6]	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
SECE1	1	2	3	1	2	3	98	84	64	1	2	4	2	2	1	21	12	8
SECE2	1	2	3	1	2	3	98	94	81	1	2	3	2	2	2	38	17	20
BRAR	1	2	3	2	3	6	100	96	32	2	3	6	3	1	1	10	9	5
BRCI	1	2	3	3	3	6	99	87	29	3	4	6	3	2	1	7	6	4
BRTE	1	2	3	2	3	6	99	95	31	3	4	7	4	2	2	9	8	4
LOPEM	1	1	3	1	2	3	99	96	61	1	3	5	2	2	1	18	12	8
VUMY1	2	5	4	3	6	7	93	33	19	3	6	8	2	1	1	7	5	2
VUMY2	3	5	4	3	5	4	92	37	19	3	5	8	2	1	1	8	5	2
BRPE	3	3	3	2	3	5	80	77	46	2	3	5	3	3	3	8	8	4
BRSP	3	2	3	2	2	5	80	80	47	3	2	5	4	3	3	7	11	3

1 SECE1=Secale cereale 'Aroostook'; SECE2=S. cereale 'Syn-T'; BRAR=Bromus arvensis; BRCI=B. ciliatus; BRTE=B. tectorum; LOPEM=Lolium perenne ssp. multiflorum; VUMY1=Vulpia myuros Acc. No. 9041991; VUMY2=V. myuros Acc. No. 9041993; BRPE=Brassica pekinensis; BRSP=Brassica spp.

2 Ratings: 1-9; 1=Excellent; 9-Very Poor.

3 Ratings: 1-9; 1=Most Abundant; 9=Least Abundant.

4 Ratings: 1-9; 1=Most Abundant; 9=Least Abundant.

5 Ratings: 1-9; 1=Most Resistance; 9=Least Resistance

6 A=Planting Date - September 5, 1990; B=Planting Date - September 26, 1990; C= Planting Date - October 16, 1990; Data recorded December 1990-February 1991.

Table 4

Average Winter Measurements of Stand, Foliage Abundance, Percent Cover, Vigor, Resistance to Cold and Foliage Height for Nine Accessions of Cover Crops with Three Planting Dates in 1991 at Cape May PMC

Acc.[1]	Stand[2]			Foliage Abund.[3]			Percent Cover			Vigor[4]			Resistance to Cold[5]			Foliage Height (cm)		
[6]	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
SECE1	3	4	7	2	4	8	80	56	7	3	4	4	4	3	3	18	10	4
BRAR	2	4	9	6	6	9	67	35	1	4	3	3	4	4	4	10	5	3
BRCI	3	5	7	4	6	8	57	22	1	4	3	4	4	3	3	6	4	1
BRTE	3	4	9	5	5	9	72	48	1	3	3	3	7	5	5	9	5	3
LOPEM	3	4	8	6	4	8	38	40	5	3	4	3	7	4	4	14	8	4
VUMY1	4	7	9	4	8	9	50	8	2	2	4	3	2	3	3	6	3	2
VUMY2	6	8	9	6	9	9	37	5	1	4	4	6	2	3	3	5	3	2
BRPE	5	6	8	6	7	9	53	25	1	6	7	7	7	6	6	9	5	1
BRSP	4	5	8	6	5	9	60	48	3	8	7	7	6	8	8	9	5	2

1 SECE1=Secale cereale 'Aroostook'; BRAR=Bromus arvensis; BRCI=B. ciliatus; BRTE=B. tectorum; LOPEM=Lolium perenne ssp. multiflorum; VUMY1=Vulpia myuros Acc. No. 9041991; VUMY2=V. myuros Acc. No. 9041993; BRPE=Brassica pekinensis; BRSP=Brassica spp.

2 Ratings: 1-9; 1=Excellent; 9-Very Poor.

3 Ratings: 1-9; 1=Most Abundant; 9=Least Abundant.

4 Ratings: 1-9; 1=Most Abundant; 9=Least Abundant.

5 Ratings: 1-9; 1=Most Resistance; 9=Least Resistance

6 A=Planting Date - September 13, 1991; B=Planting Date - October 2, 1991; C= Planting Date - October 17, 1992; Data recorded December-February; Data recorded December 1991-February 1992.

INITIAL EVALUATION OF EASTERN GAMAGRASS (TRIPSACUM DACTYLOIDES)

Extensive acreage within the Northeast is planted to corn silage. Frequently, the crop is harvested too late to allow for the establishment of adequate winter cover, resulting in widespread soil erosion. The identification and improvement of a perennial grass for use as silage would be of great benefit in reducing the amount of soil lost to field runoff. Soil erosion would be further reduced through the introduction of a highly productive and palatable forage grass for use on marginal cropland.

Eastern gamagrass (Tripsacum dactyloides) is a tall, perennial, warm-season bunch grass. Native populations are typically monoecious with the pistillate spikelets located below the staminate on terminal racemes. Distribution is from Massachusetts west to Nebraska, south to Texas and Florida. Eastern gamagrass grows in drainage areas, streambanks, and moist places. The grass is highly productive and extremely palatable, often being greatly reduced in natural stands through preferential grazing. However, widespread use of Eastern gamagrass has been hindered by low seed production, inferior seed quality, lack of natural persistence, and difficulties with vegetative propagation.

In 1981 a mutant sex form (GSF I) was collected from Ottawa County, Kansas. GSF-I exhibited gymonoecy with pistillate spikelets below and perfect spikelets above. As a result, the number of pistillate spikelets increased by approximately twenty five-fold leading to a large potential increase in the amount of seed production.

The Cape May PMC is currently evaluating 106 accessions of Eastern gamagrass, 59 accessions of which represent native material with normal seed production (monoecious sex form or MSF) and 47 accessions which represent sexually-deviant material (gymonoecious sex form or GSF) received from the USDA/ARS Woodward, Oklahoma Experiment Station. Upon completion of initial evaluation, promising accessions will be entered into a breeding program and examined for the eventual release of a superior Eastern gamagrass accession(s) that is adapted to the mid-Atlantic region.

The 1990 and 1991 data show nineteen (19) gymonoecious sex form (GSF) accessions and fifteen (15) monoecious sex form (MSF) accessions as superior for the Cape May PMC initial evaluation. However, most of the MSF accessions appear to be polyploid, thus further examination is necessary before the initiation of the breeding program.

INITIAL EVALUATION OF COMMON SAINFOIN (*ONOBRYCHIS VICIAFOLIA*)

Both wind and water erosion forces carry off excessive amount of soil from conventionally tilled cropland which doesn't employ the use of winter cover crops. This also holds true for cropland which lays fallow. Numerous annual grains have been used to control these erosive forces during the non-growing season, such as cereal rye, winter wheat, and oats. The use of permanent cover crops is now being pursued under new conservation tillage concerns. Legumes, in general, offer potentially more than just winter cover, such as the grains listed above; they possess the ability to make more nitrogen available for the primary crop. More available nitrogren overall often results in greater yields. Common sainfoin, one such legume, is currently being evaluated for its permanent vegetative cover attributes. This plant has the potential to be utilized for many conservation activities including critical area stabilization, no-till cropping systems, animal forage, wildlife cover, and permanent cropland cover; as well as revitalizing over-cropped land by contributing more organic material and nitrogen fixation. All such uses of this Eur-Asian native will be considered after more is known of its growth characteristics and adaptability to the mid-Atlantic region.

In June of 1990, one hundred and fifty-six accessions were seeded at the Cape May Plant Materials Center in twenty foot rows. Within the first growing season, one hundred twenty-seven accessions emerged. The success of those accessions which did emerge varied greatly. It was noted during December of 1990 that this species showed good vigor for most accessions with a vibrant dark green color. In 1991, 120 accessions survived the first winter at the Cape May PMC. The three top accessions of 1990, based upon vigor, foliage, abundance, cover, stem density and survival were again the top three in 1991; they were 313063, 372829, and 401468. In 1991, nine of the top ten accessions were in the top twenty-five of 1990. Visible seed was collected during the spring and summer of 1991 and 1992. Evaluations continued throughout 1991 and 1992. At the end of the 1992 growing season, ten accessions were identified as superior and adapted to the climate of the Cape May PMC. These ten accessions will be utilized in a Random Recurrent Phenotypic Selection (RRPS) system in 1993.

INITIAL EVALUATION OF SUBTERRANEAN CLOVER (*TRIFOLIUM SUBTERRANEUM*)

Subterranean clover or subclover is used extensively as a winter annual clover in Australia. Here in the United States, it is utilized in California and Oregon with a small usage in the south. Although subclover is an annual, it reseeds readily. Subclover can be considered a "living-dead" mulch, in which it begins to grow during the late summer, survives the winter, sets blossoms in May and sets seed then dies in June and July forming a dense weed impervious mat. Subclover does not obtain much height during its growing season. It appears to be a good crop to no-till into.

In 1992, an assembly of subclover was obtained to be grown at both the Cape May and Big Flats PMCs. Seed was started in the greenhouse during the summer at Cape May and seedlings were transplanted into the field in early September. The 243 accessions were placed in rod rows. A lot of variation could be seen in the plants. The assembly will be observed for adaptability to the mid-Atlantic area.

1992

TIDAL ZONE STABILIZATION PROJECTS

FINAL REPORT OF SMOOTH CORDGRASS (SPARTINA ALTERNIFLORA)

SMOOTH CORDGRASS (*SPARTINA ALTERNIFLORA*) FOR TIDAL BANK STABILIZATION

FINAL REPORT

Tidal shore lines are exposed to severe storms and fluctuating water levels which usually result in a tremendous loss of soil due to the process of erosion. This erosion problem is extensive in Virginia, North Carolina and Maryland and to somewhat a lesser degree in Delaware and New Jersey. Efforts to solve this problem have been focused on engineering structures and transplanting of native cordgrasses from nearby marshes along tidal areas.

Since 1977, the Cape May PMC has conducted various studies to help solve this problem through the use of vegetation. The majority of efforts were concentrated on saline waters and were divided into two phases: 1) the stabilization of the intertidal zone, and 2) the establishment of vegetation on the beach area above the tidal zone. The latter resulted in the release of 'Avalon' saltmeadow cordgrass (*Spartina patens*) in 1986.

To stabilize the intertidal zone, the objective was to select or develop a vigorous strain of smooth cordgrass (*S. alterniflora*) that could be readily established on banks and saline tidal waters.

Smooth cordgrass is a salt tolerant perennial species which grows in the intertidal zone of saline and brackish marshes and along river banks. The grass is characterized by long, slender, flexible culms and a thick rhizomatous root system. Planted along the shoreline, the smooth cordgrass absorbs wave energy and collects the sediment brought in by the water currents. As the sediment is dropped, the band of vegetation expands, pushing the mean high tide line away from the tow of the bank, reducing the potential for continuing erosion.

Evaluations

Smooth cordgrass was produced and evaluated by the Cape May PMC staff SCS/USDA from 1979 to 1991. The assembly of 111 collections was made in 1977 and 1978 and was planted at the PMC. The collection area included the mid-Atlantic coastal plain from Massachusetts to Florida and along the coast of Louisiana and Texas (Table 1). All accessions were established using vegetative materials. The original plantings were made in a simulated tidal basin that was excavated in a permeable soil. The plants were flooded with fresh water twice each week during the summer. The plant growth was fair to good in the shallow basin despite the lack of normal tidal cycles or saline water. The basin was not flooded during the winter months which resulted in excessive loss from desiccation and cold temperatures. While 79 accessions survived, only 70 contained sufficient planting stock

for outplanting. Seven additional accessions were added to the planting bringing the total of 77.

Initial Evaluation

Initial evaluations began in 1979. The 77 plant accessions were taken from the collection holding area and outplanted into a shallow pond. Fresh water was used to flood the plants twice each week during the growing season. Occasional flooding events were also performed during the dormancy period to assist the plants' chances of survival throughout the winter. Plant performance varied significantly between accessions for vigor, foliage height, rhizomatous growth, flowering dates and weights for above and below ground vegetation.

In the spring of 1980, 40 of the 77 accessions were selected for further testing due to their winter hardiness, early regrowth, good foliage abundance and exceptional good vigor (Tables 2 and 3). While some of the planting continued to be placed on the center, the majority of them were placed on actual tidal sites at off-center locations (Tables 4-6). The number of accessions within the study was reduced to three during the initial evaluation process.

The standard growing techniques for the on-center planting were continued including periodic flooding of the planted areas. Observations for the on-center sites indicated that smooth cordgrass can be grown successfully under simulated tidal conditions by flooding the plants with fresh water during the summer. Occasional flooding during the dormant season appears to increase the winter survival rate. The use of salt or saline water is not required to produce high quality plants or maintain good plant growth, but plants grown in fresh water do require hardening in salt water prior to outplanting on a saline site. Frequent and high rates of fertilizer stimulates plant growth and is considered necessary when establishing plants on artificial sites.

Advanced/Final Evaluations

This process began in the spring of 1988. The three remaining accessions: PI-421162, PI-421200, and PI-421228 were planted and evaluated at various locations within the states of New York, New Jersey, Maryland, Virginia, and North Carolina. Containerized plants consisting of 2 1/4" peat pots were used in all plantings. Thirty grams of 18-6-12 controlled release fertilizer were placed beneath each potted plant to encourage and maintain good, vigorous growth.

PI-421162 was considered the overall best of the three accessions. It consistently grew further out into the water, had more dense foliage and had vigor equal to the second best accessions PI-421200. PI-421200, which was second best, produced

a taller plant with less foliage. PI-421228 performed the worst of the three accessions on the majority of the sites.

In the fall of 1991, the collected data showed that PI-421200 and PI-421162 were exhibiting a high level of performance (Table 7) for vigor, foliage abundance and percent ground cover which make them both excellent plants for controlling erosion on tidal areas. While PI-421200 was about equal to PI-421162 in foliage abundance and percent cover, PI-421162 was rated superior for vigor (Table 7). In previous evaluation date, it also showed that PI-421162 was consistently superior for rhizome spread and rhizome production. Along with these superior traits, PI-421162 has exhibited its ability during the initial establishment years to grow and survive at lower elevations within the water.

Based upon the slim margin of superior consistent performance in several important areas, PI-421162 was selected for release and given the name 'Bayshore' after 13 years of testing.

The principal conservation use of Bayshore smooth cordgrass is to vegetate and help stabilize tidal shorelines as well as the construction and restoration of wetlands.

Table 1

Characteristics of the *Spartina alterniflora* Accessions, 1978

Accession Number	Origin	Cold Injury	New Growth
421139	VA	Moderate-Severe	No
421140	VA	None	Yes
421141	VA	None	No
421142	VA	None	Yes
421143	VA	Moderate-Severe	Yes
421144	VA	Moderate-Severe	Yes
421145	VA	None	Yes
421146	VA	None	Yes
421147	VA	None	Yes
421148	VA	Severe	No
421149	VA	Moderate-Severe	No
421150	VA	Moderate-Severe	No
421151	VA	Severe	yes
421152	VA	Moderate-Severe	No
421153	VA	None	Yes
421154	VA	None	Yes
421155	VA	Moderate-Severe	No
421156	VA	Moderate-Severe	No
421157	MD	Severe	No
421158	MD	Severe	Yes
421159	MD	None	Yes
421160	MD	None	No
421161	MD	Moderate-Severe	Yes
421162	MD	None	Yes
421163	MD	None	Yes
421164	MD	None	Yes
421165	MD	Moderate-Severe	No
421166	MD	None	Yes
421167	MD	None	Yes
421168	DE	Severe	No
421169	DE	None	Yes
421171	CT	None	Yes
421172	CT	None	Yes
421173	CT	None	Yes
421174	CT	None	Yes
421175	MA	None	Yes
421176	MA	None	Yes
421177	MA	None	Yes
421178	MA	None	Yes

Table 1
(cont.)

Characteristics of the *Spartina alterniflora* Accessions, 1978

Accession Number	Origin	Cold Injury	New Growth
421179	MA	None	Yes
421180	MA	None	Yes
421181	MA	None	Yes
421182	MA	None	Yes
421183	NY	None	Yes
421184	NY	None	Yes
421185	NY	None	Yes
421186	NY	None	Yes
421187	NY	None	Yes
421188	NY	None	Yes
421189	NY	None	Yes
421190	NY	None	Yes
421191	NY	Moderate-Severe	Yes
421192	NY	Moderate-Severe	No
421193	NY	Moderate-Severe	Yes
421194	NY	Moderate-Severe	Yes
421195	NJ	None	Yes
421196	NJ	None	Yes
421197	NJ	None	Yes
421198	NJ	None	Yes
421199	NJ	None	Yes
421200	NJ	None	Yes
421201	NJ	Moderate-Severe	No
421202	NJ	None	Yes
421203	NJ	None	Yes
421205	NC	Severe	No
421207	NC	Moderate-Severe	No
421208	NC	None	No
421209	VA	Moderate-Severe	No
421210	VA	None	Yes
421211	VA	Moderate-Severe	No
421212	VA	Severe	No
421213	NC	Severe	No
421214	NC	Severe	No
421215	SC	Severe	No
421216	SC	Severe	No
421217	SC	Severe	No
421218	SC	Severe	No

Table 1
(cont.)

Characteristics of the *Spartina alterniflora* Accessions, 1978

Accession Number	Origin	Cold Injury	New Growth
421219	LA	Moderate-Severe	No
421220	VA	None	No
421221	VA	None	Yes
421222	VA	Moderate-Severe	Yes
421223	VA	Moderate-Severe	Yes
421224	MD	Moderate-Severe	No
421225	MD	Moderate-Severe	Yes
421226	MD	Severe	No
421227	MD	Moderate-Severe	No
421228	NJ	None	Yes
421229	NJ	None	Yes
421230	NJ	None	Yes
421231	NJ	None	Yes
421232	NJ	None	Yes
421233	TX	Moderate-Severe	No
421234	TX	Severe	No
421235	GA	Severe	No
421236	GA	Severe	No
71890	NJ	Moderate-Severe	No
71893	NJ	Moderate-Severe	No
71900	NC	None	No
71938	LA	Severe	No
71939	NC	Severe	No
F-7015	FL	Moderate-Severe	No
F-7018	FL	Severe	No
F-7109	FL	Severe	No
00075	NJ	None	Yes
00133	NJ	-	-
00124	LA	-	Yes
00137	MD	-	-
00135	MD	-	-
00136	MD	-	-
00188	NC	-	-

Table 2

Evaluation of 40 Accessions of *Spartina alterniflora*, 1980 [1/]

Position/ Number	Regrowth [4/]	Stem Type [2/]	Foliage Abundance [3/]
Tier 1			
421195	No	2	-
421202	Yes	2	5
421198	Yes	2	4
421200	Yes	2	6
Tier 2			
421203	Yes	4	6
421188	Yes	4	5
421190	Yes	2	6
421187	Yes	4	5
Tier 3			
421230	Yes	1	5
421221	Yes	2	4
421210	Yes	4	3
421220	Yes	2	5
Tier 4			
421231	Yes	2	3
421232	Yes	2	4
421228	Yes	2	6
421163	Yes	6	5
421169	Yes	3	5
421172	Yes	4	7
Tier 5			
421185	Yes	6	5
421184	Yes	5	6
421167	Yes	3	4
421162	Yes	4	4
Tier 6			
421175	Yes	8	4
T-2809	Yes	1	5
Tier 7			
421166	Yes	6	6
421154	Yes	2	4
421199	Yes	2	3
421153	Yes	3	6

Table 2

(cont.)

Evaluation of 40 Accessions of Spartina alterniflora, 1980

Position/ Number	Regrowth	Stem Type	Foliage Abundance
Tier 8			
421140	Yes	3	4
421159	Yes	2	5
T-2804	Yes	3	7
421145	Yes	2	6
421146	Yes	1	4
Tier 9			
421208	Yes	2	5
T-2808	Yes	4	4
T-2816	No	2	-
421144	Yes	3	4
Tier 10			
421219	Yes	2	4
421224	Yes	1	4
421192	No	4	-

1/12 plants established/accession June 12, 1978; ratings recorded April 10.

2/Stem type: 1=90% or more upright; 3=70% upright; 5=50% upright; 7=30% upright; 9=10% or less upright.

3/Foliage Abundance: 1=Most abundant, 9=Least abundant.

4/Presence or absence of spring regrowth.

Table 3

Evaluation of 40 Accessions of *Spartina alterniflora*, 1980[1/]

PI No.	Regrowth[2/]	Stand Density[2/]	Average Spread (cm)[2/]	Vigor
421195	4	4	270	4
421202	3	3	230	3
421198	4	3	220	3
421200	4	5	220	4
421203	3	3	300	3
421188	2	3	310	2
421190	1	3	330	2
421187	4	3	240	4
421230	3	2	230	4
421221	3	4	270	3
421210	3	3	320	3
421220	3	2	190	3
421231	4	3	270	4
421232	4	3	220	4
421228	3	3	290	3
421163	5	4	240	5
421169	4	3	300	4
421172	3	3	180	4
421185	3	3	230	3
421184	3	5	300	3
421167	4	5	200	4
421162	3	4	280	3
421175	4	3	260	3
T-2809	5	3	230	4
421166	4	3	230	5
421154	3	3	270	
421199	3	3	250	3
421153	2	2	230	3
421140	-	2	250	4
421159	-	2	240	3
T-2804	4	3	220	4
421145	3	4	240	3
421146	2	3	270	3
421208	3	3	230	3
T-2808	3	2	200	3
T-2816	3	4	200	3
421144	3	3	240	3
421219	3	2	120	3
421224	4	6	60	6
421192	5	4	100	4

1/Planted June 12, 1978; Data recorded May 20.
2/Ratings: 1=Excellent; 3=Good; 7=Poor.

Table 4

1986 Planting of *Spartina alterniflora* at Examore, VA.

1986 Data

Date/ Acc. No.	6/ Vigor	Foliage Abund.	1/ Stem Density	2/ Rhizome Spread	3/ Erosion Control	4/ Relative Rank	5/
July 16							
			REP I				
421230	6	7	-	5	5		
421159	5	5	-	-	5	3	
421203	6	6	-	-	5		
421162	3	4	-	-	4	1	
421199	4	5	-	-	5	2	
421228	6	6	-	-	5		
421200	6	6	-	-	5		
			REP II				
421159	4	5	-	-	5		
421230	6	7	-	-	5		
421162	3	3	-	-	4	1	
421200	6	7	-	-	5		
421228	5	6	-	-	5		
421199	4	5	-	-	5	3	
421203	4	4	-	-	5	2	
September 26							
			REP I				
421230	6	-	25	7	5		
421159	5	-	31	6	5		
421203	5	-	19	5	5		
421162	3	-	39	4	4	1	
421199	4	-	26	4	5	2	
421228	5	-	25	5	5		
421200	5	-	53	5	5	3	
			REP II				
421159	5	-	26	4	5		
421230	5	-	27	6	5		
421162	3	-	58	4	4	1	
421200	5	-	37	6	5		
421228	6	-	36	5	5		
421199	5	-	22	4	5	3	
421203	4	-	24	5	5	2	

1/1-9; 1=Excellent; 9=Dead.
2/All stems counted >5 cm at 2 random locations/accession/row.
3/1-9; 1=Excellent; 9=No Spread.
4/1-9; 1=Excellent; 9=No Control.
5/a. 1-5; 1=Best; b. 1-3; 1=Best.
6/1-9; 1=Excellent; 9=Dead.

Table 5

1987 Planting of *Spartina alterniflora* at Tanyard, MD

1987 Data

Date/ Acc. No.	Vigor 5/	Foliage Abundance 1/	Erosion Control 2/	Percent Survival 3/	Relative Rank 4/
June 23			REP I		
421228	4	4	4	100	-
421162	2	2	3	100	1
421200	3	4	4	100	3
421230	3	4	4	100	2
			REP II		
421200	3	4	4	100	2
421128	4	4	4	100	3
421230	4	5	4	100	-
421162	2	3	3	100	1
August 26			REP I		
421228	-	3	3	-	3
421162	-	4	2	-	1
421200	-	-	4	-	-
421230	-	5	3	-	2
			REP II		
421200	-	-	4	-	-
421228	-	-	3	-	3
421230	-	-	3	-	2
421162	-	-	2	-	1
October 22			REP I		
421228	-	-	3	98	2
421162	-	-	2	100	1
421200	-	-	3	100	3
421230	-	-	4	100	-
			REP II		
421200	-	-	3	100	3
421228	-	-	3	98	2
421230	-	-	4	98	-
421162	-	-	2	100	1

1/1-9; 1=Most Abundant; 9=Least Abundant.
2/1-9; 1=Excellent; 9=No Control.
3/Number Alive/Number Established.
4/1-3; 1=Best
5/1-9; 1=Excellent; 9=Dead.

Table 6

1987 Planting of *Spartina alterniflora* at Tanyard, MD

1990 Data

Date/ Acc. No.	Vigor 4/	Foliage Abundance 1/	Percent Cover 2/	Foliage Height (cm)	Relative Rank 3/
		REP I			
July 19					
421228	6	6	-	40	3
421162	3	3	-	50	1
421200	4	7	-	60	2
		REP II			
August 22					
421228	7	8	15	-	3
421162	3	3	60	-	1
421200	4	6	50	-	2
		REP III			
October 16					
421228	8	7	20	-	3
421162	4	4	50	-	2
421200	4	3	65	-	1

1/1-9; 1=Most Abundant; 9=Least Abundant.

2/Estimated visual measurement.

3/1-3; 1=Best

4/1-9; 1=Excellent; 9=Dead.

Table 7

1989 Planting of Spartina alterniflora at Examore VA.

1991 Data

Date Acc. No.	Vigor 4/	Foliage Abundance 1/	Percent Cover 2/	Relative Rank 3/
May 15		REP I		
421228	4	5	30	3
421200	2	2	60	1
421162	2	3	75	2
		REP II		
421228	4	6	20	3
421162	2	2	60	2
421200	1	1	80	1
		REP III		
421200	3	3	50	1
421228	5	7	20	3
421162	3	3	50	2
July 24		REP I		
421228	4	4	40	3
421200	2	1	65	2
421162	1	2	85	1
		REP II		
421228	5	5	30	3
421162	1	1	85	1
421200	2	1	85	2
		REP III		
421200	2	1	70	1
421228	4	6	25	3
421162	1	2	65	2

1/1-9; 1=Most Abundant; 9=Least Abundant.

2/Estimated visual measurement.

3/1-3; 1=Best.

4/1-9; 1=Excellent; 9=Dead.

1992
WIND DIVERSION PROJECTS

EVALUATION OF EASTERN RED CEDAR (*JUNIPERUS VIRGINIANA*) FOR SCREENS AND WINDBREAKS

EVALUATION OF EASTERN RED CEDAR (JUNIPERUS VIRGINIANA) FOR SCREENS AND WINDBREAKS

High wind velocity is one of the most damaging natural agents to cropland located along the mid-Atlantic coastal plain. The prevailing currents often cause the transport of soil particles, resulting in erosion and widespread crop damage. Properly established windbreaks have proven effective in helping to reduce surface wind velocity. As such, the objective of this project is to evaluate Eastern red cedar (Juniperus virginiana) ecotypes for windbreak potential and to select a rapidly growing strain that possesses semi-dense foliage and elliptical form.

Eastern red cedar is an native conifer of wide distribution and great genetic diversity. Its adaptability to a variety of soil and climatic conditions has made the tree especially attractive for screening, windbarrier and landscape purposes.

As result of Eastern red cedar's inherent genetic diversity for growth form, crown density, seedling vigor, and growth rate, it is very important that the released variety be uniform and stable for these characteristics. Thus, in 1989 production was approached by both the development of improved seed stock and by vegetative propagation. If a successful propagation method can be developed, a superior form could be identified and clonally duplicated for use as a commercially available windbreak tree.

In 1988 selections were made for the best ecotypes remaining within the project. Twelve females and five males were chosen and transplanted into a polycross nursery in order to promote random cross-pollination. In November of 1989 seed was collected, mixed, and broadcast into woody beds for harvest during the 1991 season. In the fall of 1991 and 92, the seeds were planted in raised beds and separated according to the parental accession number that the seed came from. Annually, 1/0 seedlings will be used for the establishment of progeny tests and field plantings for final evaluation.

Although literature review indicates that the vegetative propagation of Eastern red cedar is difficult, several research teams have demonstrated improved success rates by varying the type and timing of cutting as well as through the use of non-traditional growth promoter treatments. In January 1992 , a third vegetative propagation study took place at the PMC. Lateral shoot cuttings were obtained from male and female trees, trimmed to approximately 6-inches, and subjected to the following growth promotion treatments:

Treatment 1: IBA (10,000 ppm) in 50% alcohol

Treatment 2: IAA (10,000 ppm) in 50% alcohol

Treatment 3: Rootone (2000 ppm NAA, 1000 ppm IBA, 40,400 ppm Thiram)

Treatment 4: Control (untreated) in 50% alcohol

Cuttings were then placed into a bottom-heated propagation bench in the PMC greenhouse. In addition, the growth promoter treatmetns were subjected to two whole plot treatments of humidity and no humidity. the humidity treatment was produced by a humidifier and plastic tent.

After approximately 130 days of being maintained in the propagation bench, all cuttings were exposed, rinsed, and examined for mortality, callus production, and root production, (See Table 1). The humidity treatment produced more callusing and rooting but also more mortality than the no humidity treatment. It is felt the higher mortality is due to mold that infected the top growth of the leafier male accession. As for the hormone treatments, the Rootone and Control treatments produced the highest percentage of callusing of all the treatments for both the humidity and no humidity conditions. The IBA treatment produced the highest percentage of rooting of all the treatments for both the humidity and no humidity conditions. Generally, the female accession out performed the male accession.

Table 1

Percent of cuttings with callus production and root production, and percent mortality for the 1992 low-cost methodology for the vegetative propagation of Juniperus virginiana. 1/

Treatment	Average Mean Percent Mortality		Mean Percent Callusing		Mean Percent Rooting	
	Male	Female	Male	Female	Male	Female
No Humidity						
IBA (10,000 ppm)	50	60	10	25	15	10
IAA (10,000 ppm)	80	95	0	0	5	5
Rootone	25	5	40	80	10	10
Control	30	50	15	45	5	0
Humidity						
IBA (10,000 ppm)	70	5	30	20	10	55
IAA (10,000 ppm)	25	25	25	35	10	20
Rootone	20	5	30	75	5	20
Control	55	0	10	95	0	5

1/ Evaluation began on Feb. 24, 1992. Evaluation completed on May 29, 1992. Two whole plot treatments (humidity and no humidity) of forty cuttings total (twenty male - 9047099, twenty female -9047095) were evaluated per split plot (growth hormone) treatment per whole plot treatment.

1992

CONTRACTILE AGREEMENTS WITH THE NATIONAL PARK SERVICE

1. Annual Progress Report for Assateague Island National Seashore

2. Annual Progress Report for Gateway National Area

1992 Annual Progress Report for Assateague Island National Seashore

I. Project Background

The Cape May Plant Materials Center entered into a contractile agreement with the National Park Service to propagate native plant species for Assateague Island National Seashore in 1991. Currently, three grass species, three forb species, five shrub species, and three tree species will be provided to this National Seashore to protect roadways and re-vegetate old road scars in public use areas.

The plants produced at the Cape May PMC will be planted at twelve different sites located in the publicly accessible areas. The plants will be placed in nine areas where old road beds are still visible, along a new road in a newly developed camping area, culdesac islands which lack vegetation, and area dunes bordering roads which need stabilization.

The seed collected from Assateague Island in 1991 of eight species was fall planted that year. Most of the species had good to excellent emergence in the spring of 1992. Only highbush blueberry and red maple had poor emergence, pointing out special germinative requirements for these to grow adequately. Only three seed collection trips were needed in 1992 as a supply insurance. A seed production block of seaside goldenrod was established in 1992 to reduce the need for seed collection trips to Assateague Island. In 1993, 100,000 American beachgrass plants will be delivered to Assateague Island. To produce 100,000 plants for distribution, 4,000 had to be hand planted. some of the species which have been difficult to propagate in the field, such as thoroughwort and beach heather, have been grown with better success in the greenhouse.

II. Accessions Involved:

Common Name	Scientific Name	Plant Symbol	Acc. No.
red maple	Acer rubrum	ACRU	-
American beachgrass	Ammophila breviligulata	AMBR	Cape
thoroughwort	Eupitorium sp.	EUsp.	9064220
beach heath	Hudsonia tomentosa	HUTO	9064219
eastern red cedar	Juniperus virginiana	JUVI	9064218
wax myrtle	Myrica cerifera	MYCE	9064217
bayberry	Myrica pensylvanica	MYPE2	9064216
coastal panicgrass	Panicum amarum	PAAM2	421136
switchgrass	Panicum virgatum	PAVI2	421138
loblolly pine	Pinus taeda	PITA	9064215
dwarf sumac	Rhus copallinum	RHCO	9064214
northern dewberry	Rubus flagellaris	RUFL	9064213
seaside goldenrod	Solidago sempervirens	SOSE	9064212
highbush blueberry	Vaccinium corymbosum	VACO	9064211

1992 Annual Progress Report for Gateway National Area

I. Project Background

The Cape May Plant Materials Center entered a contractile agreement with the National Park Service to propagate native plant species for the Jamaica Bay and Breezy Point Units of Gateway National Recreation area in 1991. There will be three grass, two forb, three shrub and four tree species provided to this recreation area to re-vegetate road scars and newly constructed public use areas.

The first year of the contract agreement involved only native plant seed collections. 1992 was the first year of plant propagation. Seed nurseries were established for switchgrass, seaside goldenrod, wild indigo, partridge pea, and little bluestem. The contract requires the production of 3,000 bare-root trees and shrubs for delivery in 1993. The bare-root plants were propagated in 1992 in raised beds on the PMC. Bayberry, beachplum eastern red cedar, hackberry, and spicebush were produced in abundance. The date of emergence, monthly growth rate, and disease or insect damage were regularly noted. Only 25% of the time invested into these contracts was spent collecting seed in 1992.

The plants produced by the Cape May Plant Materials Center will find their way to two major road construction sites. The first is a visitor parking area near Fort Tilden. The second project receiving plants from Cape May is a new parking facility at the Jamaica Bay Wildlife Refuge Visitor Center.

II. Accessions Involved:

Common Name	Scientific Name	Plant Symbol	Acc. No.
wild indigo	Baptisia tinctoria	BATI	9064210
gray birch	Betula populifolia	BEPO	9064209
hackberry	Celtis occidentalist	CECO	9064208
partridge pea	Chamaecrista fasciculata	CHFA2	9064207
eastern red cedar	Juniperus virginiana	JUVI	9064206
spicebush	Lindera benzoin	LIBE3	9064205
tulip poplar	Liriodendron tulipifera	LITU	9064204
bayberry	Myrica pensylvanica	MYPE2	9064203
coastal panicgrass	Panicum amarum	PAAM2	421136
switchgrass	Panicum virgatum	PAVI2	9064202
beach plum	Prunus maritima	PRMA2	9064201
white oak	Quercus alba	QUAL	9064200
Virginia rose	Rosa virginiana	ROVI2	9064199
little bluestem	Schizachyrium scoparium	SCSC	9064198
seaside goldenrod	Solidago sempervirens	SOSE	9064197

1992

MISCELLANEOUS PMC PROJECTS

INITIAL EVALUATION OF VETIVER GRASS (*VETIVERIA ZIZANIODES*) FOR ADAPTABILITY TO THE MID-ATLANTIC SERVICE AREA

INITIAL EVALUATION OF VETIVER GRASS (VETIVERIA ZIZANIOIDES FOR ADAPTABILITY TO THE MID-ATLANTIC SERVICE AREA

Vetiver grass (Vetiveria zizanioides) is an Asian species that is primarily used for vegetative contour hedges and by the perfume industry. It is a densely tufted bunchgrass with stout culms up to 2 meters (6 feet) in height and terminal flowers consisting of numerous narrow racemes oriented in whorls along a central axis. Vetiver grass has an extensive branching root system that is considered useful for the prevention of soil erosion. Vetiver had been reported to lack viable flowers, rhizomes, or stolons, instead being propagated soley by root division or vegetative slips. However, two ecotypes of the grass have recently been documented: (1) a northern flowering type and (2) a southern non-flowering type. The two ecotypes differ in physiochemical characteristics, essential oil yield, and drought tolerance. Vetiver is native to warmer climates, being best suited to temperatures ranging from 21.0 to 43.5ˆC. Prior to introduction to the mid-Atlantic region, the northern-most successful planting has been in Rome, Italy, roughly 42ˆN in latitude and Mediterranean in climate.

The Cape May PMC currently is examining four accessions of vetiver grass:

196257 - Imported by the USDA/ARS Southern Regional Plant Introduction Station in 1951. No other available information.

213903 - Imported by the USDA/ARS Southern Regional Plant Introduction Station. Originally collected near Allahabad, India.

271633 - Collection number 1027 by the USDA/ARS, as imported through the Southern Regional Plant Introduction Station. Original collection site was located 18 km. north of Karmola, India.

302300 - Collection number A-7016 from India, as presented to the USDA/ARS Southern Regional Plant Introduction Station by Oklahoma State University.

All accessions were sent to the Cape May PMC as two year-old stock from the National PMC in Beltsville, Maryland. On May 3, 1990, eighteen (18) plants from each accession were outplanted on the PMC.

The vetiver accessions were excepted to winter kill, during the winter of 1990-91 and 1991-92, as Cape May, New Jersey is considered too far north for the growth of the grass. By the spring of 1992, it was found that 50-88% of the accessions were showing regrowth. Its believed the mild winters of 1990-91 and 1991-92 were the cause of this survival percentage. Although survival was high, the regrowth of the plants was fair to poor. Growth was found on the leeward side of the plants and was more sparse than expected.

CAPE MAY PMC CROP FIELDS

Field No.	1992
1	Inter-Center Strain Trial Test; *Uniola paniculata*, Sea Oats Nursery, *Ammophila breviligulata*, American Beachgrass Nursery, *Panicum virgatum* Switchgrass Nursery, *Cynodon dactylon*, 'Tufcote' Bermuda Grass
2	*Onobrychis viciafolia*, sainfoin; *Anthoxanthum odoratum*, sweet vernalgrass
3&4	*Panicum virgatum*, NJ-50 switchgrass
5&6	*Juniperus conferta*, 'Emerald Sea' shore juniper; *Myrica pensylvanica*, bayberry; *Prunus maritima*, beachplum; *Lathyrus sylvestris*, 'Lathco' flatpea
7	*Elaeagnus umbellata*, autumn olive; Various woody production species in raised beds.
8	*Ammophila breviligulata*, 1993, 'Cape' American beachgrass Production
9	Initial Increase Field
10	*Ammophila breviligulata*, 1994, 'Cape' American beachgrass Production
11	Cold Tolerant Cover Crop Study; *Ammophila breviligulata* American Beachgrass Longevity Study; Shrub Windbreak Demonstration Study; Shrub Windbreak Demonstration Study; *Buchlóe dactyloides* Adaptability Study; *Trifolium subterraneum* Evaluation.
12	*Panicum amarum* var. *amarulum* 'Atlantic' Coastal Panicgrass Production.
13	*Lespedeza thunbergii*, 'VA-70' Shrub Lespedeza Production
14	Vacant/Summer & Winter Cover Crop Shrub Lespedeza Production
15	*Spartina alterniflora*, Smooth Cordgrass Increase; *Ammophila breviligulata*, 'Bogue' American Beachgrass Increase
16	Natural - Wildlife Area
17	Permanent Grass Cover
18	*Robinia pseudoacacia*, Black Locust Holding Block

CAPE MAY PMC CROP FIELDS

Field No.	1992
19	Rosa rugosa, poly cross; Ammophila breviligulata, 'Hatteras' American beachgrass Increase; Spartina patens, saltmeadow cordgrass
20	Permanent Grass Cover
21	Vacant/Cereal Rye Winter Cover
22	Woody Tree and Shrub Holding Block
23	Panicum amarum var. amarulum 'Atlantic' Coastal Panicgrass Production
24&25	Vacant/Summer & Winter Cover Crop
26	Ammophila breviligulata, 1993, 'Cape' American beachgrass Prod. for contracts.
27	Vacant/Summer & Winter Cover Crop
28&29	Vacant/Summer & Winter Cover Crop
30	Lathyrus sylvestris, 'Lathco' flatpea Holding Block; Tripsacum dactyloides, IE of
31	Vacant/Summer & Winter - Cover Crop
32	Juniperus virginiana, eastern red cedar; Spartina patens, 'Avalon' Production; Carex kobomugi, 'Sea Isle' Japanses Sedge Production
33	Ammophila breviligulata, '92 Cape' American Beachgrass Production
34	Vacant/Summer & Winter Cover Crop
35,36	Seed Nursery for National Park Service Contracts and raised bed woody production
37,38	Vacant/Summer & Winter Cover Crop
39	Vacant/Summer & Winter Cover Crop
40	Myrica cerifera, Wax Myrtle Holding Block; Lonicera macckii, 'Rem-Red' Amur Honeysuckle Seed Orchard.

PLANT DESCRIPTIONS
of Commercially Released Cultivars from the Cape May PMC

'Rem-Red' Amur Honeysuckle (Lonicera maackii)

'Rem-Red' is a multi-stemmed, vase-shaped shrub that grows to a height of 8 to 12 feet. The plant is well suited for ornamental use or as a screen on large lots. Its primary use is to supply a source of food for wildlife during the critical winter period.

The plant's bright red fruit is about one-fourth inch in diameter and matures in late September and October. Amur honeysuckle grows best on deep, well-drained soil. The plant grows well in slightly acid soils with a sandy, loamy, or moderately clayey texture.

Rem-Red was released in 1970 as a multi-purpose plant. An adequate seed supply exists for commercial production.

'Cape' American beachgrass (Ammophila breviligulata)

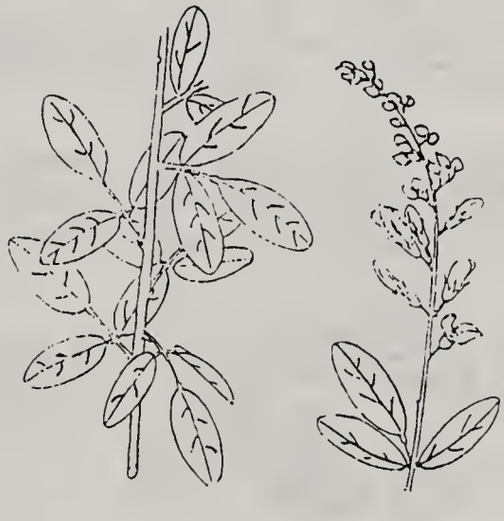
'Cape' was released for commercial production in 1972. It is a superior strain of American beachgrass. It is used along the mid-Atlantic coast for initial stabilization and establishment of sand dunes. Cape is robust, easy to plant, and spreads rapidly by vigorous rhizomes. It has healthier leaves and thicker culms or stems than common American beachgrass. An adequate supply of Cape beachgrass plants are available for commercial produotion.

'VA-70' Shrub Lespedeza (Lespedeza thunbergii)

'VA-70' shrub lespedeza is a herbaceous legume with a semi-woody stem. It is an upright perennial with stems growing 4 to 6 feet tall. The leaves are more linear than oval and are approximately 2 inches long and one-half inch wide. Attractive pink to purple flowers appear in late summer. It is an excellent source of winter food and habitat for wildlife. Pheasants and bobwhite quail use its seed for food in fall and winter. Rabbit and deer browse the leaves and bees produce honey from the flowers.

You can use VA-70 shrub lespedeza almost anywhere that shrubs are appropriate. When used in hedges and borders, VA-70 is an attractive landscape feature. The plant is particularly well suited to seeding steep banks along channels and ditches or for wildlife borders along these water courses. It is useful as a border between cropland and woodland, as contour hedges between crop strips, along diversion terrace boundaries, and in small odd areas set aside for wildlife.

VA-70 shrub lespedeza can be used alone or with other plants. An adequate supply of seed is available for commercial production.



'Avalon' Saltmeadow Cordgrass (Spartina patens)

'Avalon' is a strongly rhizomatous, salt tolerant perennial grass that grows up to 2-1/2 feet tall. Its rhizomes are long and slender and produce most of the new growth.

Avalon is unique in that it spreads quickly and produces a more dense root system and finer roots than most other saltmeadow cordgrass strains.

The principal conservation use of Avalon is to vegetate and restabilize brackish and fresh water tidal streambanks. It is salt tolerant and can be established immediately above the mean high tide elevation. It is well adapted to a range of soils, will tolerate occasional inundation by storm tides, and has the ability to trap and grow through thin layers of sand. Avalon is also adapted to low elevation coastal sand dunes and can be used to supplement other sand dune vegetation.

For establishment, both potted and bare-root plants can be used. An adequate supply of bare-root plants is available for commercial production.

'Atlantic' Coastal Panicgrass (*Panicum amarum* var. *amarulum*)

'Atlantic' is a tall, robust, native warm season perennial grass. Its growth habit is upright, with stems reaching a height of 4 to 6 feet. The plants have the appearance of a bunch grass, although they produce short rhizomes. Atlantic has strong seedling vigor and reliable seed production under cultivation. It performs satisfactorily on sandy, droughty infertile soils and on heavy imperfectly drained soils.

The principal use of Atlantic is for stabilizing disturbed sandy sites. It can be direct seeded on sand dunes except for active frontal dunes. It has also been successfully established on surface mined areas, sanitary land fills, dredged spoil fills, sand and gravel mines, road side embankments and similar disturbed areas. While most stands of Atlantic are established by drilling the seed, small areas can be vegetated with seedling plants.

Field tests show Atlantic to be well adapted in the coastal plain and piedmont region from Massachusetts to Texas. It has also been grown inland in Pennsylvania and Ohio. Atlantic's resistance to lodging and its seed production also enhance its value as food and cover for wildlife.

It was cooperatively released by the Soil Conservation Service and the New Jersey Agricultural Experiment Station in 1981. Limited quantities of seed are available for commercial production.

'Sea Isle' Japanese Sedge (*Carex kobomugi*)

Japanese sedge has been introduced onto the dunes from New Jersey south to Virginia. It is native to northeastern Asia and exhibits several desirable characteristics for stabilizing sand dunes. Japanese sedge, a salt tolerant tufted plant, differs from most related sedges by growing in drier areas. The plant, which grows 8 to 10 inches tall, spreads primarily by short rhizomes which root at the nodes. Because of the short internodes, a mature stand of Japanese sedge is usually dense, with almost complete ground cover. This cool season plant remains green well into fall and can tolerate some, but not continuous, foot traffic.

'Sea Isle' tends to be long-lived on stable sand dunes. In addition, Japanese sedge appears to be tolerant of pests and low soil fertility. Consequently, Sea Isle may exist with less management. However, it will flourish under high levels of management such as routine fertilization and protection from pedestrian or vehicle traffic.

During the year of establishment, Japanese sedge has a higher mortality rate and exhibits little lateral spread when planted in spring. However, those established in the fall of the year prove to have good survival. Regardless, after the first year, stands of 'Sea Isle' continually improve in both vigor and density.

The plant was released in 1983 by the Soil Conservation Service and the New Jersey Agricultural Experiment Station. Limited quantities of plants are available for commercial production.

'Emerald Sea' Shore Juniper (*Juniperus conferta*)

'Emerald Sea' is a low-growing or trailing evergreen shrub which grows to approximately one foot in height. Its needles are greenish blue, softer than most junipers, and one-half to one inch long. The needles retain their blue-green color very well during the winter. Mass plantings produce a dense and uniform ground cover.

Shore juniper is well suited for planting on sand dunes near the seashore where other junipers do not grow successfully. It has good salt tolerance and grows well in sandy soils.

Emerald Sea is often used for mass or border plantings around buildings and as foreground for taller plant groups. It is also a versatile ground cover plant for steep banks around buildings, parks, and playgrounds.

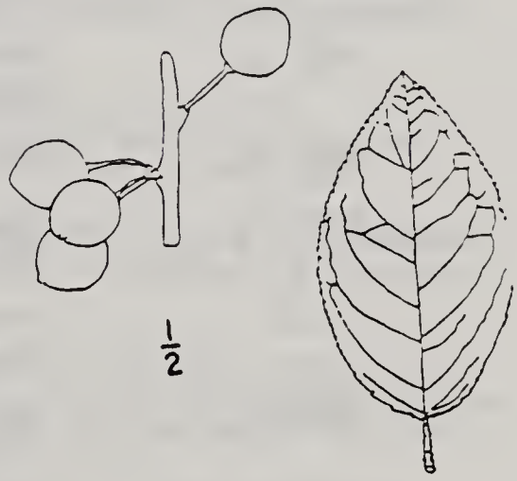
An adequate supply of unrooted cuttings are available for commercial production.

'Bayshore' smooth cordgrass
Spartina alterniflora

Smooth cordgrass, a long life perennial, is the dominant, most productive, marsh plant in the intertidal zone along the Atlantic and Gulf coast from Newfoundland to Florida and Texas. 'Bayshore' smooth cordgrass grows three to five feet tall with stems up to 1/2 inch in diameter. 'Bayshore' was selected over other accessions due to its higher stem density, which will aid in its ability to protect eroding shorelines. The leaves are twelve to twenty inches long, tapering to a point. The seedheads, produced in September and October, are ten to twelve inches long and hold twelve to fifteen spikelets, each two to three inches long. Its primary method of spread is by vigorous, hollow rhizomes; seed viability is medium to low.

'Ocean View' beach plum
Prunus maritima

Beach plum is a medium to large sized shrub native to the Atlantic coastal region. This straggling deciduous shrub of the back sand dunes may reach four to seven feet, while when grown inland it may grow to heights of sixteen to eighteen feet. The finely serrate leaves are dull green with elliptical to egg shape. Prior to leaf out in early spring, the entire shrub is covered with a bloom of snowy white flowers. Each individual flower measures 1/4 to 1/2 inches in diameter and occur in axillary clusters. By late-summer the flowers develop into 1/2 to 3/4 inch round, purplish-black, edible, fleshy fruit. In addition to reproducing from seed, beach plum is capable of spreading by means of layering on the dunes. Ocean View grows best on medium fertility, slightly acidic, loamy or sandy soils with excellent drought tolerance.

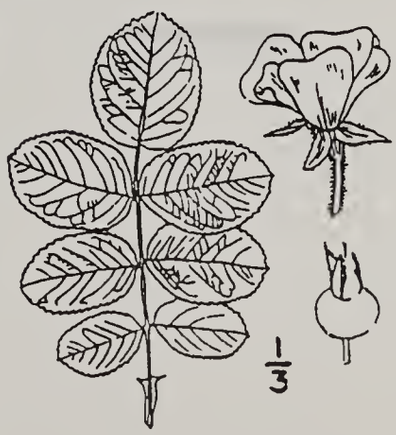


'Wildwood' bayberry
Myrica pensylvanica

After almost fifteen years of evaluation, 'Wildwood' bayberry has been released to the commercial nurseries for sand dune stabilization. Although Wildwood will seldom grow taller than five feet on the sand dunes, it is not uncommon for this shrub to attain heights of nearly ten feet on inland sites. This upright shrub has dark green aromatic leaves which are serrated, and average 1 1/2 inches in length. Dioecious flowers form inconspicuously, developing into waxy grayish-white fruit on female plants. The fruit ripens in October, and are eaten readily by both songbirds and gamebirds as a winter staple. Although released as a back dune stabilization plant, Wildwood should not be over looked for coastal landscapes, or for use in wildlife food and cover plots along the Atlantic coastal plain.

'Sandy' rugosa rose
Rosa rugosa

In December of 1992 'Sandy' rugosa rose was officially released to the commercial nursery market, primarily as a back dune stabilization plant for the Mid-Atlantic coastal plain. This showy but hardy shrub is one of the few species of rose which can withstand salt spray. This deciduous plant has dark green compound leaves. The stems are covered with needle-like thorns. These shrubs can attain heights of four to five feet. A very popular characteristic of Sandy is its large (2-3 inches) diameter flower blooms, which range in color from white to purple. In late summer the flowers give rise to equally colorful orange to red hips. This rose grows best on coarse to medium textured soils of the Mid-Atlantic coastal plain. Unlike many common wild roses, Sandy spreads primarily by slow growing rhizomes.



PRESENTATIONS, PUBLICATIONS AND WORKSHOPS

January 14	Presentation on plant materials to Cape May City Garden Club by Donald Hamer.
February 6	PMC Field Tour for Gateway National Recreation Area personnel by Mike Fournier.
April 10	Presentation on Plant Chemical Reclamation Study to SCS Staff in Delaware by Sandra Primard.
May 4-8	National Agronomy and Plant Materials Workshop in Billings, Montana attended by Don Hamer, Mike Fournier and Sandra Primard.
May 12	PMC Field Tour for Cape May Regional High School students by staff.
May 27	PMC Field Tour for NENTC personnel by staff.
May 28	Workshop on saltmeadow cordgrass for New York State Staff by Donald Hamer.
June 4	PMC Field Tour for Soil and Water Conservation Society by staff.
June 5	PMC Field Tour for State Office personnel by Don Hamer.
August 25	PMC Field Tour for Delaware and Maryland SCS staff by PMC staff.
Sept. 19-20	Exhibit displayed by Donald Hamer, Michael Fournier, Sandra Primard, and Barbara Turnier at the Wings and Water Festival held at the Wetlands Institute in Stone Harbor, New Jersey.
December 2	Registration article written by Don Hamer on 'Bayshore' smooth cordgrass (Spartina alterniflora)
December 15	Release notice was written by Mike Fournier and Don Hamer on 'Wildwood' bayberry (Myrica pensylvanica), 'Sandy' rugosa rose (Rosa rugosa), and 'Ocean View' beachplum (Prunus maritima) in the American Nurseryman, pages 74-75.
December	Restoration of Sand Dune publication - Hamer, Belcher, and Miller.

SCS TRAINING RECEIVED

January 16	Native Plants Symposium held in Columbus, New Jersey attended by Mike Fournier.
February 13	Regional Grounds Maintenance Conference held in Ocean City, New Jersey attended by Sandra Primard.
February 26-28	Plant Chemical Reclamation Study training at the University of Rhode Island was attended by Sandra Primard.
March 30- April 2	"Lab and Field Techniques for Plant Materials" training course held in Crowley, Louisiana attended by Michael Fournier.
May 21	Irrigation Water Management given by Rutgers in Centerton, New Jersey attended by Sandra Primard.
June 24, 25 and July 25	Total Quality Management training given by SCS-NJ in Clayton, New Jersey attended by the staff with the exception of Barbara Turnier.
August 3	"Leadership Supervisory Skills for Women" seminar held in Atlantic City, New Jersey attended by Sandra Primard.
September 29	"Self-Empowerment Skills for Women" seminar held in Atlantic City, New Jersey attended by Barbara Turnier.
October 21, 22 and November 17	Total Quality Management training given by SCS-NJ in Bordentown, New Jersey attended by Barbara Turnier.
October 26-29	"Biology of Legumes" training course held in Athens, Georgia attended by Mike Fournier and Sandra Primard.

EQUIPMENT

January	Nikon High Resolution Labophot-2A Microscope
February	Chevy Astro Van
June	New Holland Skid Steer Loader with Bucket and Pallet Forks
June	Maschio Row Cultivator

1992 CAPE MAY PMC PLANT & SEED DISTRIBUTION

Cultivar	Species	Amount No.	Amount lbs.	States of Distribution
Atlantic	coastal panicgrass		267	(CAN, CO, DE, KY, MA, MD, PA SC, UT)
Avalon	saltmeadow cordgrass	42,300		(CA, KY, MA, MD NC, NJ, NY, OH PA, SC, TN)
Bayshore	smooth cordgrass	45		(LA)
Cape	American beachgrass	97,285		(DE, MA, MD, MI NC, NJ, NY, OH SC, VA, WV)
Emerald Sea	shore juniper	975		(DE, KY, MD, MI
NJ-50	switchgrass		95	(CAN, KY,NE,OH
Rem-Red	amur honeysuckle	275	7	(DE, KY, MD, MI ND, NJ, OH, TN
Sea Isle	Japanese sedge	1,535		(DE, MA, MD, OH
VA-70	shrub lespedeza		368	(DE, KY, MD, NC NJ, OH, PA, SC TN, WV)
Bogue Hatteras 9047071 9047072 9047073 9047085	American beachgrass	850 each		(DE, MA, NY, SC VA)
Ocracoke 515948 518820 518821	bitter panicgrass	500 each		(NC, SC, VA)
434150 548964 548965 548966	bayberry	66 each		(MA, NY)
515949 518822 518823 518824	beach plum	66 each		(MA, NY)
515950	rugosa rose	25		(MA)
	TOTAL:	150,068	737	